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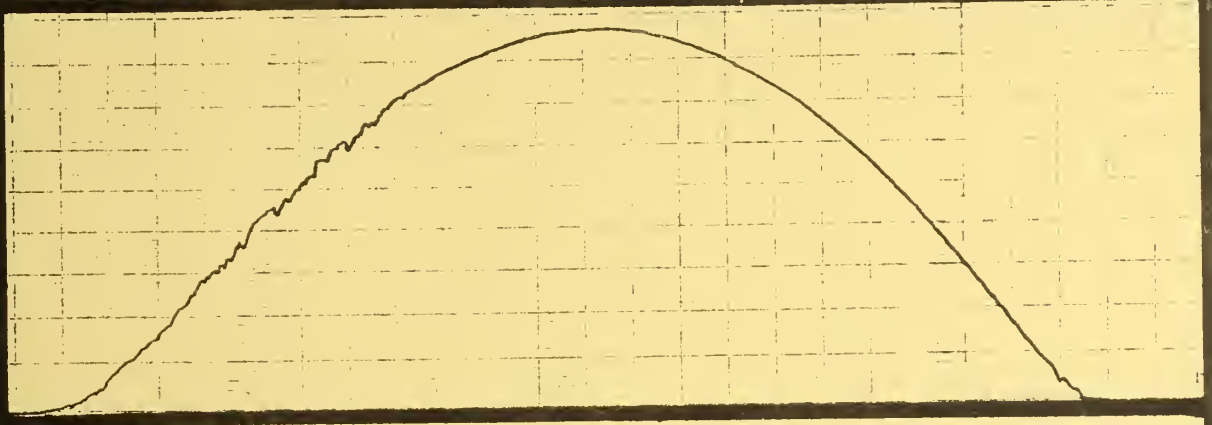

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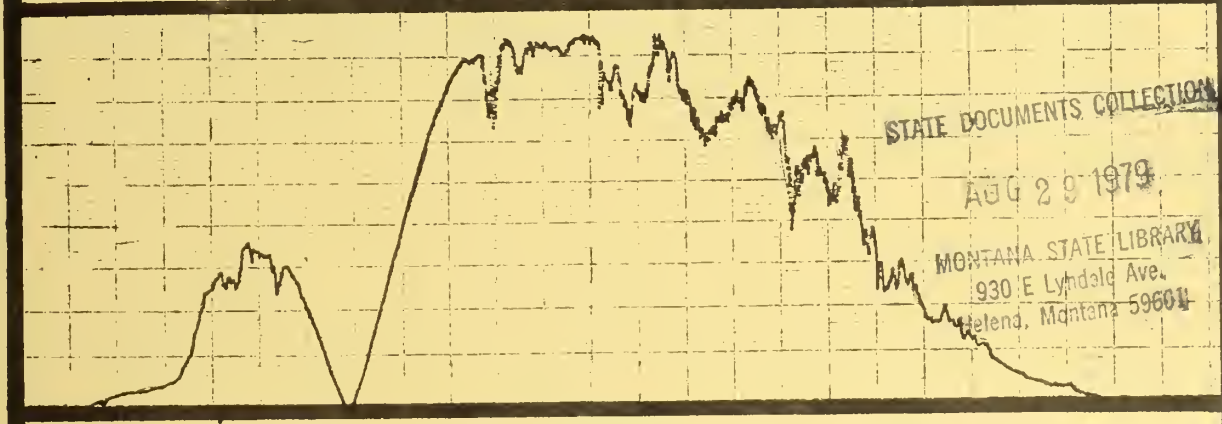

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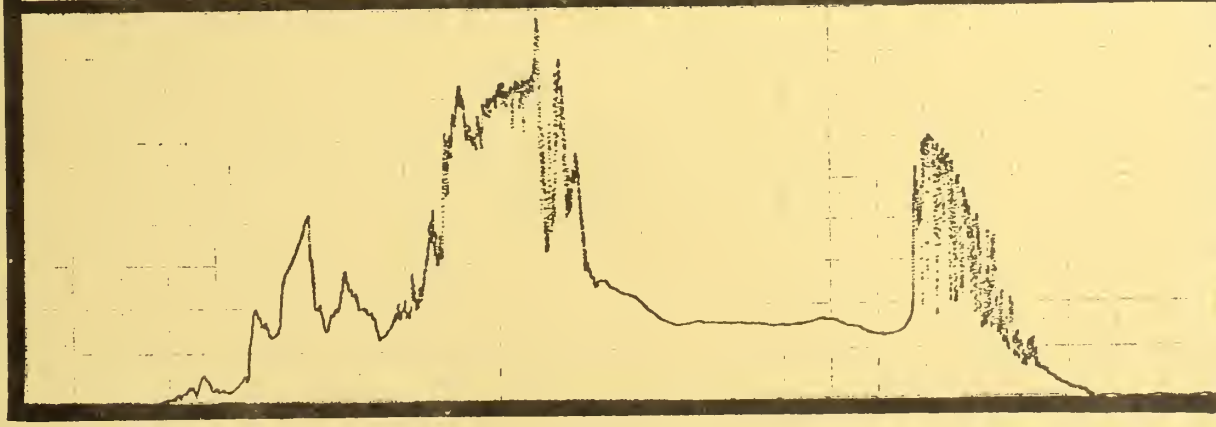

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# MONTANA SOLAR DATA MANUAL

June 1979

compiled by

Charless W. Fowlkes

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supported by

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Dana Gunderson, Engineer
Jim Iverson, Engineer

Grant No. RAE 46-Fowlkes-015, (1977)
and RAE 084-FWLKS-772, (1978)

Cover: solar radiation strip chart records illustrating clear and cloudy days
The center chart records the total eclipse, Feb. 26, 1979.

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## STATIONS WITH CONTINUOUS RECORDERS

| Location | School | Volunteer | Year |
|---|---|---|---|
| Anaconda | Anaconda | Mary Jo Oreskovich | 1978 |
| | | Tom Facey | 1978-79 |
| Billings | Billings Sr. H.S. | Mike Jablin | 1977-79 |
| Bozeman | Bozeman Sr. H.S. | Roscoe Montgomery | 1977-79 |
| Browning | Browning H.S. | Jim Prestbo | 1977-79 |
| Butte | Butte H.S. | Phil Foley | 1977-78 |
| | | John Giop | 1978-79 |
| Choteau | Choteau H.S. | Norman Kamrud | 1978-79 |
| Colstrip | Colstrip H.S. | Dave Bowser | 1977-79 |
| Dillon | Beaverhead Co. H.S. | William Mular | 1977-79 |
| Ennis | Madison Val.Cons.H.S. | Orville Hess | 1978-79 |
| Fort Benton | Fort Benton H.S. | T. Daniel Gillen | 1978-79 |
| Glasgow | Glasgow H.S. | Norman Girard | 1977-79 |
| Glendive | Dawson Co. H.S. | Edward Helgeson | 1977 |
| | | Richard Lindgren | 1978-79 |
| Great Falls | C.M. Russell H.S. | W. Gary Shelden | 1977-79 |
| Hamilton | Hamilton H.S. | William Delaney | 1977-79 |
| Harlowton | Harlowton H.S. | John Schell | 1977-78 |
| | | Milo Coladonato | 1978-79 |
| Havre | Havre H.S. | Avon Whitehead | 1977-79 |
| Helena | Helena H.S. | Jim Haslip | 1977-79 |
| Jordan | Garfield Co. H.S. | Norman Ostby | 1978 |
| | | Steven Fogle | 1978-79 |
| Kalispell | Flathead H.S. | Gary Freebury | 1977-79 |
| Lewistown | Fergus H.S. | Howard Cooper | 1977-79 |
| Libby | Libby H.S. | Mike Funk | 1977-79 |
| Livingston | Park Sr. H.S. | Ben Williams | 1978-79 |
| Miles City | Custer Co. H.S. | Otto Neuhardt | 1977-79 |
| Missoula | Hellgate H.S. | Norman Jacobson | 1977-79 |
| Plentywood | Plentywood H.S. | Harold Gackle | 1978-79 |
| Polson | Polson H.S. | Ted Macy | 1977-79 |
| Red Lodge | Red Lodge H.S. | Bob Holmen | 1978-79 |
| Sidney | Sidney Sr. H.S. | Gene Krueger | 1978-79 |
| Thompson Falls | Thompson Falls H.S. | Joni Keating | 1978 |
| | | Walter Clark | 1978-79 |
| W.Yellowstone | W. Yellowstone H.S. | Warren George | 1977-78 |
| | | Scott Carsley | 1978-79 |

## STATIONS WITH MANUAL RECORDERS

| Location | School | Volunteer | Year |
|---|---|---|---|
| Baker | Baker H.S. | Max Mueller | 1978-79 |
| Big Timber | Sweetgrass Co. H.S. | Dick Willems | 1977-78 |
| Billings | Billings West H.S. | Gerald Raab | 1978-79 |
| Boulder | Jefferson H.S. | Mike Myrhow | 1978-79 |
| Broadus | Powder River Co. H.S. | Henry Eslinger | 1977-79 |
| Chester | Chester H.S. | Marvin Krook | 1977-79 |
| Chinook | Chinook H.S. | Gail Swant | 1977-78 |
| Circle | Circle H.S. | Robert Fitzgerald | 1977-79 |
| Columbus | Columbus H.S. | Waymoth Fitzgerald, Jr. | 1977-78 |
| Conrad | Conrad H.S. | James Guthrie | 1978-79 |
| Culbertson | Culbertson H.S. | Larry Hyslop | 1978-79 |
| Deer Lodge | Powell Co. H.S. | Gary Swant | 1977-79 |
| Ekalaka | Carter Co. H.S. | Jane Frye | 1977-79 |
| Eureka | Lincoln Co. H.S. | C. W. Calvert | 1979 |
| Forsyth | Forsyth H.S. | Eli Urbaniak | 1978-79 |
| Great Falls | East Jr. H.S. | John Chase | 1979 |
| Hardin | Hardin H.S. | Roland Croghan<br>Bonnie Pluhar | 1977-78<br>1978 |
| Harlem | Harlem H.S. | G. Daniel McNeill | 1978-79 |
| Hobson | Hobson H.S. | Rick McIntyre | 1977-79 |
| Malta | Malta H.S. | Jeffrey Bredeson<br>Steve Schumacher | 1977-78<br>1978-79 |
| Missoula | Sentinel H.S. | Ronald Perrin | 1978-79 |
| Roundup | Roundup H.S. | Jim Schladweiler | 1977-79 |
| Scobey | Scobey H.S. | Dee Black | 1978-79 |
| Superior | Superior H.S. | Clark Conrow | 1977-79 |
| Townsend | Broadwater Co. H.S. | William Alley | 1977-79 |
| Whitefish | Whitefish H.S. | Bruce Tannohill | 1978-79 |
| White Sulphur Springs | Wh. Sulph. Spgs. H.S. | Connie Perkins<br>Ken Marks | 1977-78<br>1978-79 |
| Winnett | Winnett H.S. | Frank Witter | 1977-78 |
| Wolf Point | Wolf Point H.S. | Arthur Sikkink | 1977-79 |

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# I. REVIEW OF DATA BASES FOR SOLAR DESIGN

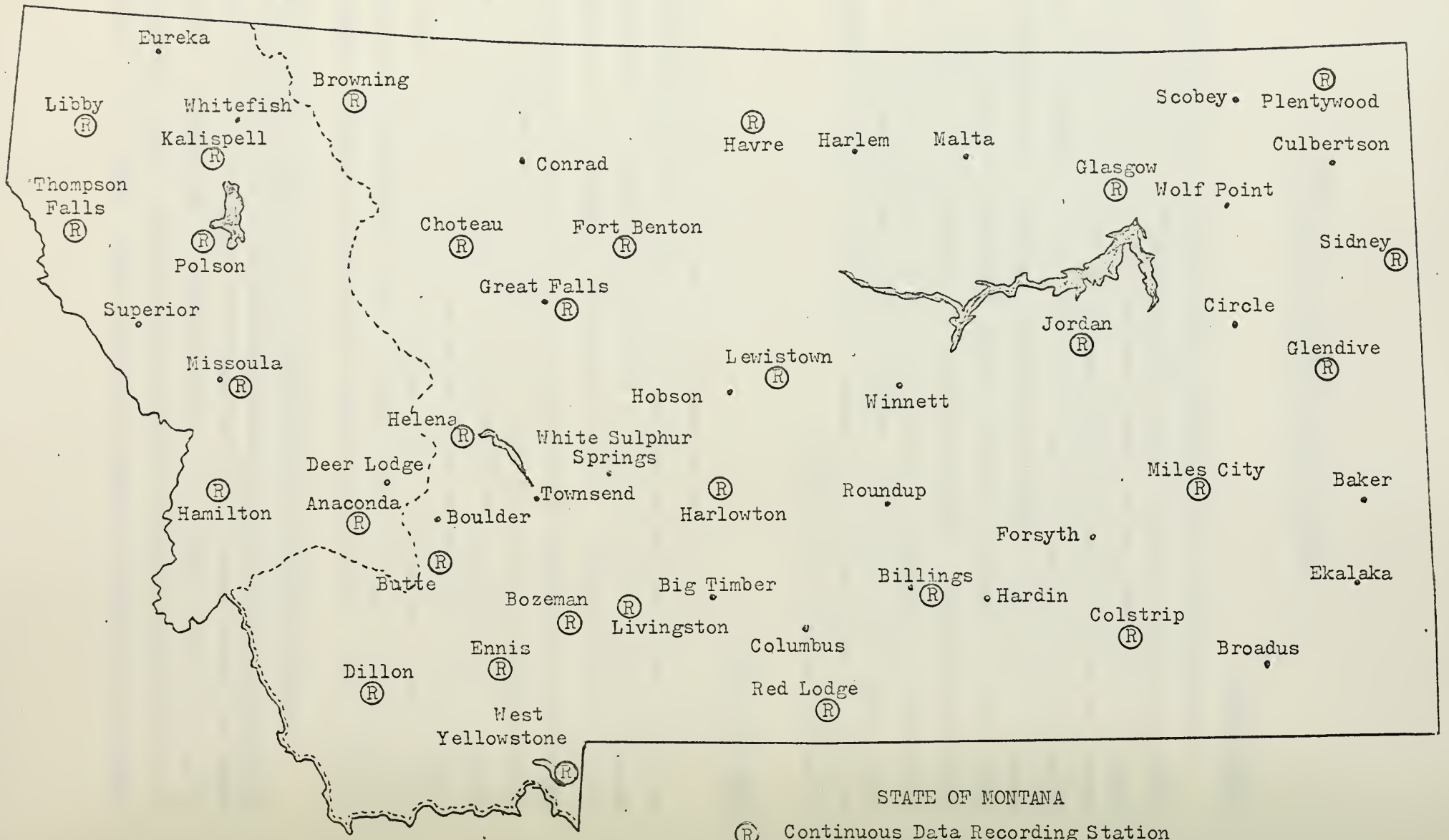
## Introduction

The design of a solar conversion system involves consideration of a number of factors including: solar radiation available at the site, climatology of site (temperatures, wind), availability of conventional energy, amount and quality of heat required, economics, taxes, etc. A sound climatological data base covering at least 40 years is available for most locations in Montana. Information on taxes, economics and conventional energy costs are readily available through established government and private institutions. Design procedures for estimating heat load and solar system performance are available in the appropriate technical literatures. Long-term average solar radiation data is unfortunately not available at many locations in Montana. It is this area that is addressed by the Montana Solar Data Manual.

## SIMM Solar Data

Early in 1977 the SIMM program (Solar Insolation Measurement, Montana) was initiated by Fowlkes Engineering under a grant from the Alternative Renewable Energy Sources Program of the Montana Department of Natural Resources and Conservation. Twenty instruments to measure solar radiation were sited across Montana during 1977 and an additional ten instruments were sited early in 1978. The map on the following page identifies the locations of the stations. The front cover of the Montana Solar Data Manual reproduces three examples of solar radiation records. The overall goal of this program is to develop a solar radiation data base for use by solar designers. The results of the first two years' measurements are presented in this Manual. The accuracy of these results are discussed in Appendix III.

The solar radiation values presented in this Manaul were all measured on a surface tilted 60° up from the horizontal and facing due south. This angle was chosen because it is representative of "typical" solar collector orientation used in Montana for collecting heat in the winter. This data can consequently be applied directly to many collector applications which improves the effective accuracy of this data base. Most of the locations


Eureka
Browning
Libby
Whitefish
Kalispell
Havre
Harlem
Malta
Scobey
Plentywood
Culbertson
Conrad
Glasgow
Wolf Point
Thompson Falls
Choteau
Fort Benton
Polson
Great Falls
Sidney
Superior
Circle
Jordan
Glendive
Missoula
Lewistown
Hobson
Winnett
Helena
White Sulphur Springs
Deer Lodge
Miles City
Baker
Hamilton
Anaconda
Townsend
Harlowton
Roundup
Boulder
Forsyth
Butte
Billings
Ekalaka
Big Timber
Hardin
Bozeman
Livingston
Colstrip
Ennis
Columbus
Broadus
Dillon
Red Lodge
West Yellowstone
STATE OF MONTANA
Continuous Data Recording Station
Manual Data Station
Continental Divide

covered in this Manaul have no other source of measured solar insolation.

The main limitation to the use of the solar data in this Manual is the relatively short time period (one to two years) represented. There is no simple way at this time to access how "typical" these values are. The designer can compare the two years' data given in the Manual for variability. He can also transform historical SOLMET horizontal data for Great Falls or Glasgow onto a 60° tilted surface and compare these values to 1977 and 1978 SIMM data. As the SIMM data base increases the statistical confidence will naturally increase. For the time being the designer must allow for a resonable tolerance band in his design due to the absence of better alternatives.

SOLMET Solar Data

The National Climatic Center, Asheville, N. C. has archived historical solar radiation data for two locations in Montana: Great Falls and Glasgow. This data has been recently rehabilitated to an accuracy level of ± 5% and is part of the SOLMET data base. This data will soon be available in tables as well as computer readable tapes. Also available in the SOLMET data base are derived solar radiations for Billings, Cut Bank, Dillon, Helena, Lewistown, Miles City and Missoula. The data for these locations is estimated from cloud cover observations and its accuracy is about ± 13%.

All SOLMET solar data is for radiation on a horizontal surface. Solar collector surfaces in Montana will normally be tilted from 45° to 90° up from horizontal, thus the SOLMET data cannot be used directly but must be converted to the appropriate tilt angle. There are several sources of error when using horizontal solar data which the designer should recognize: (1) The horizontal radiation data itself will tend to be less accurate in the winter due to the low altitude of the sun relative to a horizontal surface (cosine error) and possible temperature effects on the calibration factor. (2) Reflections from the snow will affect the total radiation on tilted surfaces (solar collectors), whereas the horizontal data will be relatively unaffected. (We have measured reflected radiation in winter on a vertical surface amounting to 10 to 20% of the global radiation.) (3) The calculation methods used to transform horizontal to tilted surface radiation

are necessarily approximate and are subjects of continuing discussion in the technical literature.

The factors listed above can produce an uncertainty of around ± 20% in the calculated, tilted surface radiation. The solar designer should take account of the effect of these uncertainties on the sizing and anticipated performance of his system.

ASHRAE Clear Day Tables

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has published a number of books and manuals containing a wealth of information on using solar data and solar conversion system design. Every solar designer should obtain a copy of ASHRAE-GRP 170, the "red book". The ASHRAE Handbook of Fundamentals also includes a comprehensive review of solar energy facts and references.

The Handbook of Fundamentals and GRP-170 contain extensive tables listing the clear day solar radiation on surfaces oriented at various azimuths and tilt angles. These tables allow the designer to estimate the maximum radiation striking on a collector surface. The average radiation will be considerably less than these values (approximately 30 to 70%) due to clouds and atmospheric filtering. GRP-170 also contains the widely used methods of Liu and Jordan for estimating the radiation on tilted collector surfaces using horizontal insolation and weather data.

One ASHRAE table for 48° latitude is reproduced in this Manual. This table lists values for the altitude and azimuth of the sun each month which will help the designer evaluate the amount of shading at his site due to buildings, trees, mountains, etc. Also included are clear day radiations on surfaces tilted at various angles. This data in conjunction with the measured radiations allows the designer to define clearness factors. The tilted clear day data can also be used to form a ratio to apply to the measured data in this Manual in order to approximate the radiation on surfaces tilted at angles other than 60°.

# II. GUIDE TO THE DATA TABLES

## System of Units

Data in the Montana Solar Data Manual is tabulated using metric units. Earlier solar design books and articles will probably utilize conventional engineering units but most technical journals now require the use of metric or SI units. The units in this Manual will therefore be compatible with current and future technical literature.

The SI unit for energy is the Joule (1 Joule = 1 Watt-second). We have used the kilowatt-hour (kWh) for energy and kilowatt-hour per square meter ($kWh/m^2$ or KWH/SM) for energy-density. This convention is widely used for solar radiation. A table of conversion factors useful for solar design is included in Appendix IV of this Manual.

## Solar Data

The solar radiation data has been summarized in two formats, weekly average and monthly average. The primary quantity is the Daily Average. This quantity is calculated by adding together the measured daily energy density (in kilowatt hours per square meter) for each day in the period and dividing by the number of days in the averaging period (week of month).

Example: From the Tables for Helena, 1978
The daily average radiation for the week beginning March 5 is 5.19 $kWh/m^2$. (This value can be converted to customary engineering units by: 5.19 $kWh/m^2$ x 316.8 = 1644 $BTU/ft^2$.) This means that during the week, a surface tilted at $60^o$ and facing south would, on the average, be exposed to 5.19 kilowatt hours for each square meter of surface area, each day. (Each square foot would receive 1644 BTU each day.)

A solar collector will convert only a portion of the incident solar radiation into useful heat. A particular collector will have a "threshold value" of radiation intensity above which it can operate efficiently. In a properly operating active system the "threshold" is the point at which the circulation pump or fan turns on. In a passive system the "threshold" is the point where the solar heat coming in exceeds the heat loss of the collector. This threshold depends on many factors including the design of

the collector (number of glazings, absorptivity and insulation), the storage temperature, and the ambient air temperature and wind velocity. Typical values of this threshold would be 0.1 to 0.2 $kW/m^2$ for warm weather and 0.2 to 0.4 $kW/m^2$ for cold weather.

The Solar Data Tables include average percentages of total energy above 12 thresholds. The average energy above a particular threshold is determined by multiplying the Daily Average energy by the percentage corresponding to that threshold and dividing by 100.

> In the previous Helena example the Daily Average energy was 5.19 $kWh/m^2$. During the same week the average energy above 0.2 $kW/m^2$ was 90% (look under " > .2" in Table). Thus for a collector having a threshold of 0.2 $kW/m^2$ the maximum energy available (at 100% efficiency) is 90/100 x 5.19 = 4.67 $kWh/m^2$. The actual useful heat collected would normally be about 10 to 50% of this value depending on the system construction, ambient temperatures, etc. More discussion of solar system performance will be found in Appendix I.

Manual Solar Data

In addition to the 30 continuous solar recording stations there are currently 15 manual solar recording stations. The transducer for the manual stations is essentially the same as the recording station except that a meter is used in place of the strip chart recorder and the instrument is hand held.

The volunteers at the manual stations are requested to make at least one reading of the solar intensity at $60^o$ tilt, facing south around noon each school day. The readings are sometimes taken by teachers and often by the high school students as a project. The data is recorded on a prepared data form and sent to Fowlkes Engineering each month for processing. Some of the volunteers take and record readings hourly during the school day. No data is taken on weekends or during the summer vacation.

We process the data by averaging all available hourly solar intensity readings each month. These values are plotted against time along with the zero points representing sunrise and sunset. A curve is drawn through these points to produce an "average day" insolation curve. This curve is inte-

grated and the result presented in the Manual Data Tables.

The accuracy of this manual data depends primarily on the care with which the readings were taken and consequently cannot be easily determined. The solar designer should compare the Manual Data with nearby continuous recording stations to judge its probable accuracy.

## Missing Data

As you look through the Solar Data Tables you will note that there are some periods for which no data is listed. Missing data near the beginning of the year is usually because the program had only recently been funded and the instruments were not installed yet. There have been three cases of stolen or vandalized instruments causing several months of lost data. Some schools had remodeling projects and electrical power outages which interfered with the continuity of the data. There were two cases in which strip chart records became entangled with the janitor's power floor waxer and were lost. Some records have been lost because the recorder ran out of chart paper or malfunctioned and some data was lost in the mail. Questionable data due to snow-covered transducers or faulty electrical connections were thrown out. In Lewistown the transducer is mounted on a 2 foot mast on the roof. During January 1978 they had $2\frac{1}{2}$ feet of snow and the hatchway to the roof was frozen shut; therefore about 2 weeks of data were lost. Total lost data due to all causes was about 17% of the current data base of 24,000 data-days.

The solar data tables flag lost data with parenthesis placed around the daily average. These parenthesis indicate that at least one day of data was missing in the averaging period.

## Cloudy Day Statistics

Tables of the occurences of cloudy days for each station show the number of times each year a specified duration of cloudy days occured. A cloudy day was defined as a day with a total energy density less than 1.5 $KWh/m^2/day$ (473 $BTU/ft^2/day$). It is assumed that most solar collectors would deliver no useful heat on these "cloudy" days. The Tables were compiled for both the total year and the heating season, defined as October 1

to May 21. The number of data-days available are shown in parenthesis above each table.

Example:

To find the number of occurences of "n" or more cloudy days, add the occurences of "n" to all occurences greater than "n". In Kalispell in 1978 for a sample of 353 days there were 31 single cloudy days and 15 cloudy periods of 2 or more days. Helena in 1978 for a sample of 353 days had 22 single cloudy days and 11 cloudy periods of 2 or more days. During the heating season in Helena there were only 18 single cloudy days and 10 periods of 2 or more cloudy days.

The Cloudy Day Statistics will be useful in determining an optimal thermal storage size for a given system. The designer should note the total number of data-days associated with each table. Stations with significant missing data days will have distorted cloudy day statistics. The designer must also take into account the limited time span (one to two years) of this data.

Climatological Data

Selected long-term average climatological data taken from National Weather Service records is reproduced in this Manual. For the convenience of the user the tables are reproduced in metric as well as conventional engineering units. Included are monthly average temperatures; mean daily, maximum daily and minimum daily; monthly record high and record low. The average degree days for each month, base 18.3° C (65° F), are also listed. This data should be useful in estimating the heat requirements of new designs.

# 1977 SOLAR DATA

alphabetically by station

Weekly Averages, pages 11 - 30

Monthly Averages, pages 31 - 40

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | | | | | | | | | | | | | |
| JAN 30 | (5.90) | 99 | 97 | 94 | 91 | 83 | 79 | 72 | 60 | 36 | 4 | 0 | 0 |
| FEB 6 | 4.82 | 94 | 86 | 82 | 75 | 70 | 67 | 58 | 46 | 29 | 5 | 0 | 0 |
| FEB 13 | 3.11 | 83 | 73 | 67 | 63 | 54 | 47 | 36 | 25 | 17 | 5 | 0 | 0 |
| FEB 20 | (3.70) | 66 | 58 | 56 | 53 | 50 | 45 | 39 | 31 | 25 | 12 | 0 | 0 |
| FEB 27 | 4.98 | 97 | 92 | 87 | 82 | 79 | 68 | 53 | 44 | 29 | 7 | 2 | 0 |
| MAR 6 | 4.08 | 96 | 86 | 76 | 65 | 55 | 46 | 34 | 23 | 9 | 2 | 0 | 0 |
| MAR 13 | 3.81 | 90 | 82 | 78 | 71 | 56 | 43 | 34 | 27 | 11 | 1 | 0 | 0 |
| MAR 20 | (4.67) | 86 | 77 | 74 | 71 | 65 | 58 | 48 | 38 | 27 | 4 | 2 | 0 |
| MAR 27 | 3.35 | 88 | 64 | 48 | 33 | 27 | 24 | 22 | 18 | 14 | 5 | 0 | 0 |
| APR 3 | (6.23) | 98 | 94 | 91 | 86 | 82 | 76 | 68 | 54 | 38 | 2 | 0 | 0 |
| APR 10 | 5.35 | 96 | 90 | 84 | 77 | 67 | 61 | 51 | 39 | 22 | 1 | 0 | 0 |
| APR 17 | 4.36 | 86 | 77 | 70 | 60 | 54 | 45 | 36 | 26 | 7 | 1 | 0 | 0 |
| APR 24 | 5.71 | 97 | 94 | 90 | 85 | 78 | 68 | 54 | 35 | 4 | 0 | 0 | 0 |
| MAY 1 | 4.38 | 96 | 87 | 75 | 65 | 53 | 41 | 29 | 17 | 4 | 0 | 0 | 0 |
| MAY 8 | 5.14 | 96 | 93 | 85 | 76 | 69 | 58 | 47 | 27 | 0 | 0 | 0 | 0 |
| MAY 15 | 2.85 | 78 | 59 | 45 | 35 | 24 | 19 | 15 | 7 | 0 | 0 | 0 | 0 |
| MAY 22 | 4.12 | 94 | 85 | 75 | 69 | 58 | 44 | 25 | 8 | 0 | 0 | 0 | 0 |
| MAY 29 | 5.22 | 95 | 92 | 88 | 81 | 73 | 61 | 39 | 16 | 0 | 0 | 0 | 0 |
| JUN 5 | (3.94) | 90 | 79 | 70 | 62 | 48 | 38 | 32 | 21 | 0 | 0 | 0 | 0 |
| JUN 12 | 4.43 | 94 | 85 | 79 | 69 | 60 | 48 | 37 | 24 | 6 | 0 | 0 | 0 |
| JUN 19 | 5.23 | 94 | 92 | 87 | 83 | 72 | 60 | 49 | 30 | 3 | 0 | 0 | 0 |
| JUN 26 | 4.77 | 95 | 92 | 85 | 78 | 67 | 52 | 38 | 19 | 0 | 0 | 0 | 0 |
| JUL 3 | 4.71 | 95 | 89 | 82 | 71 | 63 | 55 | 46 | 22 | 0 | 0 | 0 | 0 |
| JUL 10 | 4.65 | 93 | 85 | 77 | 70 | 64 | 54 | 41 | 21 | 0 | 0 | 0 | 0 |
| JUL 17 | 4.82 | 95 | 91 | 85 | 76 | 61 | 52 | 38 | 17 | 0 | 0 | 0 | 0 |
| JUL 24 | 4.46 | 92 | 85 | 77 | 69 | 61 | 50 | 37 | 25 | 1 | 0 | 0 | 0 |
| JUL 31 | 4.54 | 91 | 79 | 71 | 65 | 61 | 54 | 42 | 28 | 1 | 0 | 0 | 0 |
| AUG 7 | 5.35 | 96 | 92 | 89 | 82 | 75 | 66 | 56 | 40 | 9 | 0 | 0 | 0 |
| AUG 14 | 5.38 | 95 | 89 | 84 | 79 | 72 | 65 | 51 | 37 | 7 | 0 | 0 | 0 |
| AUG 21 | 4.12 | 94 | 85 | 77 | 69 | 61 | 42 | 29 | 19 | 2 | 0 | 0 | 0 |
| AUG 28 | 5.10 | 97 | 90 | 84 | 76 | 65 | 56 | 47 | 31 | 16 | 0 | 0 | 0 |
| SEP 4 | 6.24 | 98 | 95 | 91 | 90 | 82 | 75 | 65 | 53 | 33 | 2 | 0 | 0 |
| SEP 11 | 4.69 | 84 | 77 | 68 | 63 | 59 | 52 | 44 | 33 | 20 | 0 | 0 | 0 |
| SEP 18 | 4.49 | 95 | 82 | 74 | 69 | 64 | 59 | 48 | 34 | 16 | 8 | 2 | 0 |
| SEP 25 | (5.61) | 98 | 94 | 89 | 79 | 79 | 74 | 62 | 43 | 35 | 18 | 0 | 0 |
| OCT 2 | (2.53) | 75 | 60 | 42 | 33 | 28 | 21 | 19 | 9 | 8 | 0 | 0 | 0 |
| OCT 9 | 4.25 | 83 | 77 | 67 | 62 | 57 | 49 | 40 | 30 | 20 | 2 | 0 | 0 |
| OCT 16 | 5.28 | 98 | 93 | 90 | 87 | 80 | 72 | 61 | 41 | 18 | 1 | 0 | 0 |
| OCT 23 | 5.00 | 97 | 94 | 89 | 84 | 77 | 68 | 54 | 40 | 14 | 0 | 0 | 0 |
| OCT 30 | 4.42 | 97 | 93 | 86 | 75 | 66 | 57 | 44 | 32 | 16 | 0 | 0 | 0 |
| NOV 6 | (4.25) | 98 | 92 | 85 | 78 | 66 | 60 | 53 | 40 | 23 | 2 | 0 | 0 |
| NOV 13 | (2.14) | 62 | 56 | 52 | 47 | 38 | 30 | 16 | 13 | 7 | 0 | 0 | 0 |
| NOV 20 | | | | | | | | | | | | | |
| NOV 27 | | | | | | | | | | | | | |
| DEC 4 | (1.85) | 86 | 52 | 39 | 38 | 30 | 24 | 17 | 12 | 0 | 0 | 0 | 0 |
| DEC 11 | (3.14) | 83 | 73 | 69 | 65 | 59 | 53 | 42 | 26 | 14 | 2 | 0 | 0 |
| DEC 18 | (2.91) | 50 | 49 | 48 | 48 | 44 | 44 | 41 | 34 | 22 | 0 | 0 | 0 |
| DEC 25 | (3.76) | 90 | 77 | 69 | 65 | 59 | 51 | 38 | 31 | 24 | 5 | 0 | 0 |

SOLAR RADIATION DATA for: BOZEMAN,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | (1.04) | 57 | 20 | 14 | 12 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAN 16 | 3.47 | 84 | 68 | 58 | 54 | 45 | 42 | 35 | 31 | 24 | 12 | 0 | 0 |
| JAN 23 | 3.73 | 96 | 87 | 82 | 72 | 59 | 53 | 44 | 33 | 23 | 9 | 0 | 0 |
| JAN 30 | 4.47 | 97 | 93 | 81 | 69 | 65 | 52 | 44 | 33 | 16 | 4 | 0 | 0 |
| FEB 6 | 3.98 | 86 | 74 | 69 | 64 | 58 | 52 | 44 | 37 | 17 | 0 | 0 | 0 |
| FEB 13 | 3.58 | 92 | 81 | 68 | 58 | 49 | 39 | 31 | 22 | 10 | 0 | 0 | 0 |
| FEB 20 | 3.23 | 93 | 82 | 62 | 51 | 46 | 31 | 28 | 20 | 10 | 2 | 0 | 0 |
| FEB 27 | 3.81 | 91 | 84 | 71 | 58 | 48 | 37 | 33 | 31 | 26 | 20 | 9 | 0 |
| MAR 6 | 4.22 | 93 | 77 | 67 | 57 | 52 | 42 | 38 | 34 | 30 | 17 | 3 | 0 |
| MAR 13 | | | | | | | | | | | | | |
| MAR 20 | (4.57) | 96 | 90 | 75 | 58 | 51 | 44 | 39 | 34 | 28 | 18 | 5 | 0 |
| MAR 27 | 4.36 | 96 | 88 | 80 | 62 | 55 | 43 | 37 | 25 | 11 | 7 | 2 | 0 |
| APR 3 | 5.61 | 97 | 93 | 83 | 72 | 67 | 56 | 51 | 43 | 29 | 2 | 0 | 0 |
| APR 10 | 5.81 | 96 | 94 | 87 | 78 | 70 | 64 | 55 | 50 | 33 | 6 | 0 | 0 |
| APR 17 | 5.35 | 96 | 87 | 77 | 69 | 65 | 57 | 50 | 39 | 21 | 0 | 0 | 0 |
| APR 24 | 5.25 | 95 | 92 | 88 | 78 | 75 | 64 | 50 | 34 | 12 | 0 | 0 | 0 |
| MAY 1 | 4.18 | 91 | 83 | 69 | 61 | 53 | 46 | 35 | 25 | 9 | 0 | 0 | 0 |
| MAY 8 | 4.33 | 93 | 86 | 77 | 67 | 51 | 39 | 30 | 20 | 4 | 0 | 0 | 0 |
| MAY 15 | (2.29) | 78 | 50 | 37 | 27 | 9 | 7 | 7 | 4 | 0 | 0 | 0 | 0 |
| MAY 22 | (3.57) | 86 | 75 | 65 | 56 | 36 | 29 | 17 | 12 | 0 | 0 | 0 | 0 |
| MAY 29 | 5.24 | 95 | 90 | 84 | 77 | 68 | 53 | 34 | 18 | 0 | 0 | 0 | 0 |
| JUN 5 | 3.60 | 85 | 74 | 65 | 53 | 46 | 36 | 25 | 8 | 0 | 0 | 0 | 0 |
| JUN 12 | 4.56 | 92 | 84 | 73 | 68 | 60 | 50 | 35 | 18 | 4 | 0 | 0 | 0 |
| JUN 19 | 4.89 | 94 | 89 | 83 | 74 | 65 | 55 | 38 | 13 | 0 | 0 | 0 | 0 |
| JUN 26 | 4.78 | 94 | 87 | 79 | 67 | 60 | 45 | 35 | 15 | 1 | 0 | 0 | 0 |
| JUL 3 | 4.42 | 92 | 85 | 71 | 66 | 56 | 45 | 31 | 16 | 2 | 0 | 0 | 0 |
| JUL 10 | 5.11 | 95 | 89 | 85 | 76 | 71 | 61 | 46 | 31 | 6 | 0 | 0 | 0 |
| JUL 17 | 4.94 | 95 | 88 | 80 | 71 | 60 | 44 | 35 | 18 | 1 | 0 | 0 | 0 |
| JUL 24 | 5.01 | 93 | 88 | 80 | 72 | 63 | 52 | 43 | 28 | 4 | 0 | 0 | 0 |
| JUL 31 | 4.91 | 95 | 89 | 79 | 68 | 64 | 56 | 47 | 28 | 0 | 0 | 0 | 0 |
| AUG 7 | (5.73) | 96 | 93 | 87 | 81 | 75 | 64 | 55 | 36 | 1 | 0 | 0 | 0 |
| AUG 14 | 5.60 | 97 | 93 | 89 | 83 | 78 | 68 | 56 | 39 | 3 | 0 | 0 | 0 |
| AUG 21 | (3.45) | 89 | 77 | 69 | 63 | 55 | 46 | 32 | 22 | 2 | 0 | 0 | 0 |
| AUG 28 | 4.68 | 92 | 79 | 73 | 69 | 63 | 56 | 45 | 29 | 17 | 5 | 0 | 0 |
| SEP 4 | 6.15 | 98 | 95 | 89 | 85 | 79 | 71 | 60 | 48 | 28 | 0 | 0 | 0 |
| SEP 11 | 4.90 | 89 | 83 | 74 | 70 | 63 | 59 | 53 | 46 | 32 | 1 | 0 | 0 |
| SEP 18 | (3.86) | 88 | 74 | 64 | 58 | 50 | 45 | 30 | 24 | 11 | 3 | 0 | 0 |
| SEP 25 | 2.82 | 84 | 63 | 51 | 44 | 31 | 27 | 19 | 14 | 8 | 2 | 0 | 0 |
| OCT 2 | 4.42 | 93 | 88 | 74 | 67 | 60 | 49 | 39 | 32 | 17 | 5 | 0 | 0 |
| OCT 9 | (4.80) | 82 | 70 | 63 | 60 | 58 | 53 | 48 | 43 | 33 | 14 | 3 | 0 |
| OCT 16 | (5.78) | 98 | 96 | 91 | 88 | 83 | 70 | 57 | 48 | 33 | 5 | 0 | 0 |
| OCT 23 | 3.82 | 81 | 70 | 63 | 59 | 51 | 47 | 44 | 39 | 20 | 2 | 0 | 0 |
| OCT 30 | 2.04 | 85 | 67 | 53 | 36 | 26 | 20 | 10 | 8 | 0 | 0 | 0 | 0 |
| NOV 6 | 3.24 | 91 | 76 | 68 | 64 | 54 | 39 | 37 | 32 | 24 | 7 | 3 | 0 |
| NOV 13 | 1.20 | 49 | 42 | 32 | 21 | 16 | 14 | 12 | 3 | 3 | 0 | 0 | 0 |
| NOV 20 | (1.77) | 79 | 55 | 45 | 33 | 29 | 14 | 7 | 7 | 0 | 0 | 0 | 0 |
| NOV 27 | 1.58 | 63 | 50 | 39 | 35 | 27 | 16 | 12 | 7 | 0 | 0 | 0 | 0 |
| DEC 4 | .98 | 54 | 40 | 27 | 15 | 10 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 11 | 1.31 | 67 | 53 | 36 | 29 | 22 | 18 | 15 | 13 | 9 | 5 | 5 | 0 |
| DEC 18 | 1.84 | 64 | 48 | 38 | 33 | 31 | 21 | 16 | 14 | 12 | 3 | 0 | 0 |
| DEC 25 | (4.03) | 94 | 77 | 65 | 62 | 58 | 57 | 50 | 43 | 34 | 9 | 0 | 0 |

SOLAR RADIATION DATA for: BROWNING,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | | | | | | | | | | | | | |
| JAN 30 | | | | | | | | | | | | | |
| FEB 6 | | | | | | | | | | | | | |
| FEB 13 | | | | | | | | | | | | | |
| FEB 20 | | | | | | | | | | | | | |
| FEB 27 | | | | | | | | | | | | | |
| MAR 6 | | | | | | | | | | | | | |
| MAR 13 | | | | | | | | | | | | | |
| MAR 20 | | | | | | | | | | | | | |
| MAR 27 | | | | | | | | | | | | | |
| APR 3 | (7.11) | 99 | 96 | 94 | 91 | 85 | 80 | 71 | 66 | 49 | 24 | 0 | 0 |
| APR 10 | 5.39 | 96 | 87 | 80 | 72 | 61 | 58 | 50 | 38 | 26 | 12 | 0 | 0 |
| APR 17 | 5.46 | 97 | 91 | 82 | 75 | 67 | 56 | 46 | 35 | 22 | 4 | 0 | 0 |
| APR 24 | 5.88 | 97 | 92 | 88 | 82 | 75 | 68 | 58 | 40 | 15 | 0 | 0 | 0 |
| MAY 1 | (4.64) | 95 | 91 | 84 | 68 | 54 | 42 | 29 | 15 | 3 | 0 | 0 | 0 |
| MAY 8 | 5.02 | 93 | 85 | 77 | 71 | 60 | 51 | 42 | 32 | 19 | 4 | 2 | 0 |
| MAY 15 | 3.24 | 89 | 65 | 45 | 33 | 22 | 18 | 11 | 9 | 6 | 2 | 0 | 0 |
| MAY 22 | 4.31 | 95 | 86 | 75 | 61 | 42 | 32 | 21 | 14 | 8 | 3 | 0 | 0 |
| MAY 29 | 5.36 | 95 | 89 | 82 | 78 | 72 | 64 | 50 | 35 | 5 | 0 | 0 | 0 |
| JUN 5 | (3.95) | 89 | 77 | 50 | 40 | 35 | 34 | 25 | 11 | 0 | 0 | 0 | 0 |
| JUN 12 | 4.15 | 91 | 81 | 70 | 61 | 51 | 40 | 28 | 15 | 0 | 0 | 0 | 0 |
| JUN 19 | (4.86) | 93 | 86 | 77 | 68 | 59 | 46 | 29 | 19 | 3 | 0 | 0 | 0 |
| JUN 26 | (4.60) | 93 | 87 | 80 | 71 | 53 | 42 | 32 | 18 | 0 | 0 | 0 | 0 |
| JUL 3 | 4.83 | 94 | 89 | 80 | 71 | 57 | 48 | 35 | 18 | 7 | 0 | 0 | 0 |
| JUL 10 | 4.45 | 93 | 83 | 75 | 64 | 48 | 40 | 34 | 25 | 14 | 2 | 0 | 0 |
| JUL 17 | 5.27 | 95 | 87 | 75 | 70 | 65 | 58 | 48 | 30 | 3 | 0 | 0 | 0 |
| JUL 24 | 4.07 | 78 | 71 | 61 | 55 | 47 | 42 | 37 | 23 | 8 | 0 | 0 | 0 |
| JUL 31 | 3.91 | 85 | 66 | 54 | 50 | 43 | 39 | 34 | 24 | 8 | 0 | 0 | 0 |
| AUG 7 | (6.23) | 96 | 94 | 90 | 87 | 80 | 71 | 60 | 42 | 14 | 0 | 0 | 0 |
| AUG 14 | | | | | | | | | | | | | |
| AUG 21 | | | | | | | | | | | | | |
| AUG 28 | | | | | | | | | | | | | |
| SEP 4 | (6.23) | 98 | 94 | 89 | 87 | 84 | 74 | 67 | 48 | 38 | 0 | 0 | 0 |
| SEP 11 | 3.91 | 76 | 65 | 60 | 51 | 44 | 38 | 27 | 22 | 16 | 0 | 0 | 0 |
| SEP 18 | (4.75) | 93 | 83 | 74 | 69 | 66 | 60 | 52 | 36 | 23 | 0 | 0 | 0 |
| SEP 25 | 3.14 | 68 | 52 | 50 | 46 | 44 | 38 | 29 | 24 | 12 | 3 | 0 | 0 |
| OCT 2 | 3.70 | 92 | 75 | 65 | 56 | 54 | 41 | 32 | 24 | 10 | 0 | 0 | 0 |
| OCT 9 | (4.55) | 90 | 81 | 69 | 64 | 62 | 57 | 48 | 35 | 21 | 0 | 0 | 0 |
| OCT 16 | 5.19 | 98 | 95 | 92 | 88 | 78 | 72 | 59 | 38 | 15 | 0 | 0 | 0 |
| OCT 23 | 3.40 | 93 | 81 | 67 | 61 | 54 | 46 | 39 | 29 | 16 | 0 | 0 | 0 |
| OCT 30 | 3.43 | 95 | 86 | 73 | 61 | 46 | 38 | 33 | 26 | 17 | 2 | 0 | 0 |
| NOV 6 | 3.35 | 91 | 85 | 70 | 63 | 54 | 45 | 32 | 19 | 10 | 0 | 0 | 0 |
| NOV 13 | (2.85) | 89 | 73 | 61 | 49 | 44 | 35 | 32 | 16 | 7 | 0 | 0 | 0 |
| NOV 20 | 2.00 | 83 | 55 | 41 | 21 | 18 | 14 | 10 | 8 | 6 | 0 | 0 | 0 |
| NOV 27 | 2.66 | 69 | 62 | 59 | 59 | 52 | 48 | 39 | 27 | 11 | 0 | 0 | 0 |
| DEC 4 | .93 | 53 | 23 | 19 | 19 | 16 | 12 | 5 | 2 | 0 | 0 | 0 | 0 |
| DEC 11 | 1.29 | 63 | 33 | 22 | 22 | 21 | 19 | 11 | 7 | 0 | 0 | 0 | 0 |
| DEC 18 | (2.96) | 92 | 75 | 65 | 59 | 51 | 42 | 31 | 15 | 3 | 0 | 0 | 0 |
| DEC 25 | (3.22) | 86 | 64 | 63 | 58 | 55 | 46 | 35 | 27 | 4 | 0 | 0 | 0 |

# SOLAR RADIATION DATA for: BUTTE, MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | (4.97) | 99 | 96 | 90 | 87 | 76 | 63 | 53 | 34 | 20 | 2 | 0 | 0 |
| JAN 30 | 4.27 | 95 | 82 | 78 | 70 | 61 | 50 | 40 | 30 | 21 | 2 | 0 | 0 |
| FEB 6 | 4.05 | 92 | 86 | 77 | 75 | 68 | 60 | 53 | 41 | 17 | 3 | 0 | 0 |
| FEB 13 | 4.61 | 98 | 93 | 89 | 77 | 62 | 54 | 45 | 31 | 18 | 3 | 0 | 0 |
| FEB 20 | 3.02 | 93 | 77 | 61 | 49 | 42 | 32 | 21 | 18 | 9 | 3 | 0 | 0 |
| FEB 27 | 3.53 | 91 | 73 | 67 | 53 | 44 | 38 | 32 | 21 | 18 | 14 | 2 | 0 |
| MAR 6 | 3.59 | 92 | 74 | 65 | 54 | 48 | 43 | 38 | 33 | 20 | 12 | 2 | 0 |
| MAR 13 | 3.55 | 94 | 74 | 57 | 49 | 39 | 27 | 20 | 14 | 7 | 5 | 0 | 0 |
| MAR 20 | 4.50 | 96 | 86 | 76 | 66 | 56 | 42 | 35 | 29 | 20 | 10 | 0 | 0 |
| MAR 27 | (3.99) | 76 | 69 | 62 | 56 | 46 | 42 | 39 | 33 | 24 | 8 | 2 | 0 |
| APR 3 | 5.17 | 97 | 87 | 82 | 68 | 60 | 49 | 43 | 36 | 25 | 0 | 0 | 0 |
| APR 10 | 5.50 | 97 | 92 | 85 | 72 | 65 | 57 | 51 | 43 | 27 | 4 | 0 | 0 |
| APR 17 | 5.81 | 97 | 93 | 88 | 82 | 73 | 67 | 55 | 43 | 22 | 1 | 0 | 0 |
| APR 24 | 5.14 | 96 | 91 | 81 | 74 | 66 | 59 | 50 | 38 | 23 | 0 | 0 | 0 |
| MAY 1 | 3.25 | 87 | 69 | 54 | 41 | 31 | 22 | 15 | 10 | 2 | 0 | 0 | 0 |
| MAY 8 | 4.21 | 95 | 83 | 69 | 59 | 43 | 36 | 29 | 22 | 7 | 0 | 0 | 0 |
| MAY 15 | 2.92 | 83 | 59 | 51 | 38 | 26 | 18 | 12 | 6 | 5 | 0 | 0 | 0 |
| MAY 22 | (3.26) | 91 | 68 | 53 | 35 | 24 | 18 | 18 | 12 | 3 | 0 | 0 | 0 |
| MAY 29 | (5.18) | 95 | 89 | 87 | 79 | 68 | 53 | 36 | 13 | 0 | 0 | 0 | 0 |
| JUN 5 | 3.01 | 79 | 64 | 54 | 39 | 32 | 25 | 20 | 7 | 2 | 0 | 0 | 0 |
| JUN 12 | 4.50 | 94 | 90 | 84 | 73 | 62 | 49 | 32 | 12 | 3 | 0 | 0 | 0 |
| JUN 19 | 4.62 | 94 | 90 | 80 | 67 | 58 | 46 | 32 | 13 | 0 | 0 | 0 | 0 |
| JUN 26 | (5.23) | 96 | 93 | 88 | 80 | 72 | 58 | 41 | 7 | 0 | 0 | 0 | 0 |
| JUL 3 | | | | | | | | | | | | | |
| JUL 10 | | | | | | | | | | | | | |
| JUL 17 | | | | | | | | | | | | | |
| JUL 24 | | | | | | | | | | | | | |
| JUL 31 | | | | | | | | | | | | | |
| AUG 7 | | | | | | | | | | | | | |
| AUG 14 | | | | | | | | | | | | | |
| AUG 21 | | | | | | | | | | | | | |
| AUG 28 | | | | | | | | | | | | | |
| SEP 4 | | | | | | | | | | | | | |
| SEP 11 | (4.14) | 91 | 72 | 65 | 59 | 57 | 49 | 41 | 31 | 17 | 4 | 0 | 0 |
| SEP 18 | 4.01 | 91 | 80 | 72 | 59 | 51 | 40 | 33 | 21 | 11 | 3 | 0 | 0 |
| SEP 25 | 2.96 | 87 | 69 | 57 | 38 | 31 | 23 | 22 | 17 | 13 | 6 | 0 | 0 |
| OCT 2 | 4.27 | 94 | 83 | 76 | 65 | 55 | 48 | 39 | 28 | 22 | 5 | 0 | 0 |
| OCT 9 | 5.23 | 96 | 90 | 80 | 71 | 65 | 58 | 50 | 41 | 28 | 5 | 0 | 0 |
| OCT 16 | 5.71 | 98 | 95 | 92 | 87 | 83 | 72 | 57 | 39 | 24 | 2 | 0 | 0 |
| OCT 23 | 3.53 | 94 | 85 | 78 | 68 | 59 | 42 | 34 | 21 | 11 | 0 | 0 | 0 |
| OCT 30 | 3.14 | 95 | 85 | 77 | 68 | 57 | 43 | 31 | 25 | 9 | 2 | 2 | 0 |
| NOV 6 | (5.02) | 98 | 95 | 94 | 86 | 83 | 72 | 58 | 45 | 32 | 16 | 0 | 0 |
| NOV 13 | | | | | | | | | | | | | |
| NOV 20 | | | | | | | | | | | | | |
| NOV 27 | (2.42) | 68 | 57 | 51 | 43 | 40 | 37 | 29 | 24 | 12 | 2 | 0 | 0 |
| DEC 4 | 1.10 | 78 | 29 | 14 | 12 | 11 | 9 | 5 | 0 | 0 | 0 | 0 | 0 |
| DEC 11 | 1.25 | 57 | 35 | 32 | 27 | 27 | 24 | 22 | 14 | 11 | 4 | 0 | 0 |
| DEC 18 | 2.38 | 70 | 52 | 46 | 44 | 38 | 31 | 24 | 19 | 11 | 0 | 0 | 0 |
| DEC 25 | (3.75) | 88 | 74 | 71 | 65 | 61 | 56 | 49 | 33 | 20 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: COLSTRIP,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | | | | | | | | | | | | | |
| JAN 30 | | | | | | | | | | | | | |
| FEB 6 | | | | | | | | | | | | | |
| FEB 13 | (3.95) | 96 | 91 | 86 | 70 | 63 | 55 | 48 | 41 | 23 | 4 | 0 | 0 |
| FEB 20 | 3.96 | 86 | 72 | 61 | 56 | 51 | 45 | 38 | 32 | 22 | 11 | 0 | 0 |
| FEB 27 | 5.29 | 90 | 85 | 82 | 76 | 72 | 65 | 54 | 48 | 38 | 17 | 0 | 0 |
| MAR 6 | 4.70 | 96 | 92 | 84 | 69 | 62 | 52 | 37 | 29 | 21 | 12 | 2 | 0 |
| MAR 13 | 4.94 | 96 | 92 | 84 | 75 | 68 | 58 | 44 | 33 | 24 | 11 | 2 | 0 |
| MAR 20 | 4.96 | 91 | 80 | 76 | 72 | 65 | 59 | 51 | 37 | 26 | 9 | 0 | 0 |
| MAR 27 | 3.54 | 88 | 61 | 55 | 45 | 34 | 26 | 22 | 16 | 13 | 6 | 0 | 0 |
| APR 3 | 5.89 | 97 | 94 | 90 | 87 | 78 | 69 | 57 | 43 | 26 | 3 | 0 | 0 |
| APR 10 | (6.10) | 97 | 94 | 92 | 88 | 82 | 76 | 61 | 46 | 24 | 0 | 0 | 0 |
| APR 17 | 4.93 | 94 | 82 | 72 | 65 | 58 | 50 | 44 | 32 | 21 | 1 | 0 | 0 |
| APR 24 | (6.02) | 96 | 92 | 90 | 85 | 78 | 73 | 60 | 44 | 23 | 0 | 0 | 0 |
| MAY 1 | (4.35) | 89 | 77 | 66 | 58 | 48 | 44 | 34 | 25 | 11 | 0 | 0 | 0 |
| MAY 8 | 5.94 | 96 | 92 | 89 | 82 | 77 | 69 | 55 | 29 | 3 | 0 | 0 | 0 |
| MAY 15 | 3.27 | 82 | 58 | 48 | 40 | 34 | 31 | 23 | 17 | 6 | 3 | 0 | 0 |
| MAY 22 | 4.91 | 95 | 86 | 79 | 73 | 63 | 53 | 39 | 27 | 5 | 0 | 0 | 0 |
| MAY 29 | 5.22 | 94 | 90 | 86 | 81 | 72 | 56 | 38 | 15 | 1 | 0 | 0 | 0 |
| JUN 5 | (5.10) | 94 | 92 | 87 | 80 | 67 | 50 | 37 | 8 | 0 | 0 | 0 | 0 |
| JUN 12 | | | | | | | | | | | | | |
| JUN 19 | | | | | | | | | | | | | |
| JUN 26 | | | | | | | | | | | | | |
| JUL 3 | | | | | | | | | | | | | |
| JUL 10 | | | | | | | | | | | | | |
| JUL 17 | | | | | | | | | | | | | |
| JUL 24 | | | | | | | | | | | | | |
| JUL 31 | | | | | | | | | | | | | |
| AUG 7 | | | | | | | | | | | | | |
| AUG 14 | | | | | | | | | | | | | |
| AUG 21 | | | | | | | | | | | | | |
| AUG 28 | | | | | | | | | | | | | |
| SEP 4 | | | | | | | | | | | | | |
| SEP 11 | | | | | | | | | | | | | |
| SEP 18 | | | | | | | | | | | | | |
| SEP 25 | | | | | | | | | | | | | |
| OCT 2 | | | | | | | | | | | | | |
| OCT 9 | | | | | | | | | | | | | |
| OCT 16 | | | | | | | | | | | | | |
| OCT 23 | | | | | | | | | | | | | |
| OCT 30 | | | | | | | | | | | | | |
| NOV 6 | | | | | | | | | | | | | |
| NOV 13 | | | | | | | | | | | | | |
| NOV 20 | | | | | | | | | | | | | |
| NOV 27 | | | | | | | | | | | | | |
| DEC 4 | | | | | | | | | | | | | |
| DEC 11 | | | | | | | | | | | | | |
| DEC 18 | | | | | | | | | | | | | |
| DEC 25 | | | | | | | | | | | | | |

SOLAR RADIATION DATA for: DILLON,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | (5.22) | 97 | 95 | 95 | 90 | 84 | 82 | 75 | 55 | 43 | 17 | 0 | 0 |
| JAN 23 | (4.69) | 98 | 92 | 89 | 82 | 78 | 70 | 59 | 43 | 23 | 8 | 0 | 0 |
| JAN 30 | (4.87) | 98 | 90 | 80 | 72 | 68 | 61 | 54 | 47 | 38 | 18 | 0 | 0 |
| FEB 6 | (4.91) | 96 | 88 | 82 | 71 | 66 | 63 | 56 | 49 | 35 | 14 | 2 | 0 |
| FEB 13 | (5.22) | 98 | 94 | 89 | 84 | 80 | 66 | 55 | 38 | 20 | 10 | 2 | 0 |
| FEB 20 | (2.59) | 92 | 74 | 59 | 49 | 38 | 24 | 17 | 6 | 0 | 0 | 0 | 0 |
| FEB 27 | 2.92 | 88 | 66 | 56 | 51 | 39 | 33 | 24 | 16 | 11 | 1 | 0 | 0 |
| MAR 6 | 3.53 | 92 | 73 | 65 | 54 | 43 | 34 | 26 | 20 | 15 | 1 | 0 | 0 |
| MAR 13 | 4.45 | 87 | 79 | 76 | 69 | 58 | 54 | 43 | 31 | 17 | 10 | 2 | 0 |
| MAR 20 | 4.75 | 94 | 90 | 80 | 66 | 57 | 49 | 38 | 27 | 16 | 10 | 3 | 0 |
| MAR 27 | (3.96) | 96 | 89 | 74 | 58 | 53 | 36 | 27 | 22 | 18 | 12 | 2 | 0 |
| APR 3 | 5.78 | 97 | 92 | 88 | 79 | 70 | 62 | 55 | 46 | 27 | 10 | 0 | 0 |
| APR 10 | (5.53) | 97 | 93 | 85 | 81 | 77 | 72 | 66 | 59 | 43 | 4 | 0 | 0 |
| APR 17 | 5.50 | 97 | 92 | 86 | 75 | 66 | 58 | 52 | 44 | 20 | 1 | 0 | 0 |
| APR 24 | (4.95) | 95 | 87 | 79 | 76 | 69 | 58 | 50 | 33 | 10 | 0 | 0 | 0 |
| MAY 1 | (3.73) | 88 | 75 | 69 | 54 | 49 | 34 | 26 | 16 | 0 | 0 | 0 | 0 |
| MAY 8 | (3.85) | 93 | 84 | 68 | 52 | 43 | 36 | 18 | 4 | 0 | 0 | 0 | 0 |
| MAY 15 | 3.65 | 93 | 78 | 64 | 47 | 35 | 28 | 24 | 14 | 5 | 1 | 0 | 0 |
| MAY 22 | (4.17) | 95 | 85 | 77 | 61 | 49 | 30 | 17 | 11 | 4 | 2 | 0 | 0 |
| MAY 29 | 5.85 | 96 | 92 | 89 | 80 | 74 | 64 | 51 | 39 | 4 | 1 | 0 | 0 |
| JUN 5 | 3.55 | 89 | 69 | 52 | 45 | 41 | 38 | 29 | 22 | 4 | 0 | 0 | 0 |
| JUN 12 | 4.94 | 94 | 89 | 84 | 76 | 70 | 60 | 44 | 22 | 2 | 0 | 0 | 0 |
| JUN 19 | 5.60 | 96 | 93 | 89 | 82 | 75 | 64 | 47 | 17 | 0 | 0 | 0 | 0 |
| JUN 26 | 3.57 | 89 | 69 | 57 | 45 | 38 | 27 | 17 | 6 | 0 | 0 | 0 | 0 |
| JUL 3 | (1.17) | 79 | 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JUL 10 | (6.02) | 96 | 93 | 91 | 84 | 76 | 68 | 57 | 45 | 8 | 0 | 0 | 0 |
| JUL 17 | 4.92 | 95 | 90 | 86 | 74 | 66 | 58 | 50 | 32 | 6 | 0 | 0 | 0 |
| JUL 24 | 5.09 | 86 | 79 | 76 | 72 | 65 | 56 | 50 | 37 | 4 | 0 | 0 | 0 |
| JUL 31 | (3.86) | 78 | 61 | 60 | 55 | 51 | 43 | 34 | 25 | 2 | 0 | 0 | 0 |
| AUG 7 | 3.85 | 79 | 54 | 52 | 50 | 46 | 42 | 36 | 28 | 4 | 0 | 0 | 0 |
| AUG 14 | 5.53 | 96 | 92 | 88 | 83 | 77 | 65 | 53 | 37 | 6 | 0 | 0 | 0 |
| AUG 21 | (3.58) | 90 | 77 | 67 | 54 | 47 | 35 | 30 | 17 | 7 | 3 | 0 | 0 |
| AUG 28 | (5.46) | 95 | 90 | 86 | 83 | 78 | 67 | 58 | 50 | 36 | 8 | 0 | 0 |
| SEP 4 | 6.63 | 98 | 96 | 93 | 88 | 82 | 75 | 67 | 56 | 35 | 3 | 0 | 0 |
| SEP 11 | 4.50 | 89 | 78 | 72 | 68 | 62 | 55 | 44 | 33 | 21 | 0 | 0 | 0 |
| SEP 18 | 4.18 | 93 | 87 | 79 | 70 | 58 | 53 | 43 | 35 | 20 | 4 | 0 | 0 |
| SEP 25 | 3.51 | 94 | 82 | 68 | 57 | 46 | 36 | 32 | 17 | 7 | 0 | 0 | 0 |
| OCT 2 | (4.91) | 97 | 94 | 89 | 81 | 72 | 60 | 43 | 30 | 21 | 9 | 2 | 0 |
| OCT 9 | 5.34 | 95 | 82 | 75 | 73 | 62 | 59 | 53 | 46 | 34 | 12 | 0 | 0 |
| OCT 16 | 5.58 | 98 | 95 | 92 | 87 | 80 | 69 | 51 | 37 | 23 | 6 | 0 | 0 |
| OCT 23 | 3.97 | 90 | 82 | 70 | 65 | 58 | 46 | 37 | 23 | 11 | 0 | 0 | 0 |
| OCT 30 | 3.29 | 92 | 79 | 66 | 60 | 52 | 36 | 26 | 20 | 13 | 7 | 0 | 0 |
| NOV 6 | 4.35 | 96 | 91 | 85 | 80 | 74 | 72 | 61 | 47 | 32 | 5 | 0 | 0 |
| NOV 13 | 1.98 | 86 | 66 | 54 | 43 | 23 | 14 | 5 | 2 | 0 | 0 | 0 | 0 |
| NOV 20 | 2.79 | 90 | 66 | 49 | 40 | 38 | 33 | 25 | 18 | 13 | 3 | 0 | 0 |
| NOV 27 | 2.51 | 74 | 56 | 46 | 38 | 29 | 25 | 22 | 14 | 3 | 1 | 0 | 0 |
| DEC 4 | (2.03) | 85 | 64 | 51 | 37 | 21 | 12 | 4 | 0 | 0 | 0 | 0 | 0 |
| DEC 11 | (1.21) | 62 | 47 | 42 | 38 | 32 | 32 | 26 | 12 | 0 | 0 | 0 | 0 |
| DEC 18 | 2.26 | 75 | 54 | 52 | 44 | 41 | 31 | 27 | 21 | 8 | 0 | 0 | 0 |
| DEC 25 | (2.89) | 80 | 71 | 64 | 61 | 51 | 39 | 13 | 0 | 0 | 0 | 0 | 0 |

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | (5.44) | 98 | 96 | 94 | 91 | 82 | 82 | 71 | 57 | 34 | 0 | 0 | 0 |
| JAN 23 | 3.06 | 91 | 69 | 61 | 52 | 48 | 41 | 34 | 24 | 11 | 0 | 0 | 0 |
| JAN 30 | 3.75 | 91 | 85 | 74 | 66 | 60 | 48 | 35 | 19 | 9 | 0 | 0 | 0 |
| FEB 6 | 4.34 | 96 | 91 | 86 | 69 | 63 | 56 | 46 | 35 | 14 | 0 | 0 | 0 |
| FEB 13 | 3.09 | 85 | 68 | 60 | 55 | 47 | 39 | 30 | 22 | 13 | 0 | 0 | 0 |
| FEB 20 | 3.94 | 87 | 79 | 71 | 67 | 62 | 47 | 37 | 26 | 15 | 1 | 0 | 0 |
| FEB 27 | 5.59 | 98 | 95 | 93 | 88 | 82 | 74 | 60 | 44 | 24 | 2 | 0 | 0 |
| MAR 6 | 4.15 | 94 | 87 | 71 | 60 | 50 | 40 | 31 | 25 | 19 | 2 | 0 | 0 |
| MAR 13 | 4.51 | 96 | 82 | 75 | 67 | 51 | 43 | 35 | 26 | 18 | 4 | 0 | 0 |
| MAR 20 | 4.79 | 95 | 86 | 74 | 65 | 49 | 44 | 33 | 25 | 16 | 2 | 0 | 0 |
| MAR 27 | 3.69 | 72 | 64 | 57 | 50 | 45 | 37 | 31 | 24 | 12 | 4 | 0 | 0 |
| APR 3 | 6.23 | 97 | 94 | 91 | 87 | 80 | 72 | 65 | 48 | 28 | 3 | 0 | 0 |
| APR 10 | 5.74 | 95 | 91 | 85 | 78 | 71 | 61 | 51 | 38 | 26 | 0 | 0 | 0 |
| APR 17 | 4.65 | 93 | 83 | 76 | 63 | 52 | 40 | 36 | 26 | 7 | 0 | 0 | 0 |
| APR 24 | 5.82 | 96 | 93 | 89 | 84 | 77 | 67 | 52 | 33 | 3 | 0 | 0 | 0 |
| MAY 1 | (4.92) | 94 | 85 | 78 | 68 | 61 | 48 | 34 | 24 | 5 | 1 | 0 | 0 |
| MAY 8 | 5.52 | 96 | 91 | 85 | 81 | 68 | 60 | 46 | 29 | 1 | 0 | 0 | 0 |
| MAY 15 | 2.75 | 62 | 42 | 36 | 33 | 29 | 24 | 18 | 7 | 0 | 0 | 0 | 0 |
| MAY 22 | 4.78 | 93 | 83 | 76 | 68 | 61 | 49 | 33 | 21 | 3 | 0 | 0 | 0 |
| MAY 29 | 5.48 | 95 | 90 | 85 | 78 | 72 | 61 | 46 | 28 | 3 | 0 | 0 | 0 |
| JUN 5 | 4.53 | 93 | 82 | 70 | 63 | 56 | 45 | 30 | 15 | 1 | 0 | 0 | 0 |
| JUN 12 | 3.32 | 88 | 74 | 62 | 51 | 43 | 27 | 16 | 10 | 0 | 0 | 0 | 0 |
| JUN 19 | 4.93 | 95 | 88 | 81 | 71 | 64 | 52 | 37 | 4 | 0 | 0 | 0 | 0 |
| JUN 26 | 5.05 | 94 | 88 | 83 | 76 | 64 | 55 | 37 | 13 | 1 | 0 | 0 | 0 |
| JUL 3 | (5.08) | 95 | 89 | 84 | 74 | 63 | 50 | 39 | 19 | 4 | 0 | 0 | 0 |
| JUL 10 | | | | | | | | | | | | | |
| JUL 17 | (4.71) | 93 | 86 | 77 | 68 | 58 | 47 | 33 | 14 | 0 | 0 | 0 | 0 |
| JUL 24 | 4.79 | 95 | 88 | 78 | 68 | 63 | 53 | 46 | 25 | 0 | 0 | 0 | 0 |
| JUL 31 | 4.85 | 95 | 88 | 80 | 70 | 60 | 41 | 33 | 22 | 4 | 0 | 0 | 0 |
| AUG 7 | 4.35 | 93 | 75 | 65 | 56 | 47 | 41 | 31 | 21 | 8 | 0 | 0 | 0 |
| AUG 14 | 4.83 | 93 | 85 | 77 | 68 | 54 | 44 | 35 | 26 | 9 | 0 | 0 | 0 |
| AUG 21 | 3.68 | 92 | 75 | 67 | 49 | 42 | 35 | 28 | 19 | 4 | 0 | 0 | 0 |
| AUG 28 | 3.84 | 94 | 82 | 67 | 49 | 37 | 29 | 19 | 15 | 5 | 0 | 0 | 0 |
| SEP 4 | 4.17 | 92 | 79 | 71 | 60 | 49 | 41 | 33 | 26 | 14 | 1 | 0 | 0 |
| SEP 11 | 3.59 | 79 | 59 | 51 | 46 | 42 | 35 | 27 | 19 | 12 | 1 | 0 | 0 |
| SEP 18 | 3.01 | 85 | 64 | 54 | 44 | 39 | 29 | 14 | 10 | 2 | 0 | 0 | 0 |
| SEP 25 | 2.79 | 69 | 51 | 42 | 36 | 31 | 29 | 24 | 20 | 12 | 0 | 0 | 0 |
| OCT 2 | 3.84 | 83 | 78 | 71 | 63 | 56 | 46 | 34 | 21 | 6 | 0 | 0 | 0 |
| OCT 9 | 4.56 | 95 | 86 | 75 | 67 | 56 | 49 | 40 | 31 | 19 | 2 | 0 | 0 |
| OCT 16 | 5.02 | 97 | 94 | 89 | 83 | 75 | 61 | 50 | 41 | 19 | 0 | 0 | 0 |
| OCT 23 | 4.61 | 97 | 89 | 86 | 79 | 70 | 64 | 49 | 32 | 18 | 0 | 0 | 0 |
| OCT 30 | 4.06 | 96 | 90 | 85 | 77 | 69 | 59 | 44 | 35 | 14 | 3 | 0 | 0 |
| NOV 6 | 4.04 | 97 | 87 | 81 | 70 | 64 | 54 | 45 | 29 | 4 | 0 | 0 | 0 |
| NOV 13 | 2.48 | 73 | 62 | 54 | 41 | 33 | 27 | 19 | 10 | 3 | 0 | 0 | 0 |
| NOV 20 | (1.97) | 86 | 65 | 51 | 37 | 30 | 18 | 14 | 11 | 3 | 0 | 0 | 0 |
| NOV 27 | (2.04) | 83 | 61 | 49 | 39 | 31 | 25 | 18 | 4 | 0 | 0 | 0 | 0 |
| DEC 4 | 2.21 | 83 | 54 | 44 | 38 | 33 | 28 | 18 | 11 | 0 | 0 | 0 | 0 |
| DEC 11 | 2.03 | 74 | 49 | 43 | 40 | 37 | 31 | 29 | 19 | 2 | 0 | 0 | 0 |
| DEC 18 | 2.10 | 83 | 54 | 41 | 37 | 30 | 21 | 19 | 5 | 0 | 0 | 0 | 0 |
| DEC 25 | (2.25) | 83 | 66 | 54 | 43 | 34 | 30 | 25 | 14 | 0 | 0 | 0 | 0 |

# SOLAR RADIATION DATA for: GLENDIVE,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | (2.55) | 75 | 59 | 47 | 42 | 31 | 26 | 24 | 21 | 13 | 12 | 0 | 0 |
| JAN 30 | 4.27 | 96 | 91 | 80 | 72 | 70 | 63 | 56 | 44 | 37 | 16 | 0 | 0 |
| FEB 6 | 4.58 | 96 | 89 | 82 | 74 | 70 | 62 | 54 | 44 | 29 | 8 | 0 | 0 |
| FEB 13 | 2.95 | 89 | 69 | 55 | 50 | 35 | 30 | 22 | 16 | 8 | 2 | 0 | 0 |
| FEB 20 | 3.94 | 92 | 77 | 70 | 66 | 56 | 50 | 42 | 31 | 21 | 1 | 0 | 0 |
| FEB 27 | 4.85 | 97 | 88 | 80 | 75 | 69 | 61 | 49 | 37 | 23 | 3 | 0 | 0 |
| MAR 6 | 3.86 | 92 | 81 | 69 | 60 | 50 | 41 | 30 | 19 | 8 | 3 | 0 | 0 |
| MAR 13 | 4.75 | 92 | 82 | 76 | 68 | 62 | 56 | 42 | 33 | 18 | 2 | 0 | 0 |
| MAR 20 | 4.56 | 91 | 80 | 73 | 63 | 56 | 43 | 34 | 26 | 15 | 0 | 0 | 0 |
| MAR 27 | 3.79 | 77 | 65 | 60 | 53 | 45 | 36 | 27 | 15 | 8 | 0 | 0 | 0 |
| APR 3 | 5.54 | 96 | 91 | 84 | 77 | 70 | 61 | 53 | 43 | 25 | 0 | 0 | 0 |
| APR 10 | 5.47 | 97 | 93 | 86 | 77 | 68 | 59 | 50 | 39 | 18 | 1 | 0 | 0 |
| APR 17 | 4.51 | 94 | 86 | 70 | 55 | 48 | 43 | 38 | 27 | 18 | 0 | 0 | 0 |
| APR 24 | 6.02 | 96 | 93 | 89 | 83 | 78 | 72 | 62 | 49 | 17 | 2 | 0 | 0 |
| MAY 1 | 4.48 | 89 | 78 | 72 | 62 | 50 | 46 | 37 | 29 | 4 | 0 | 0 | 0 |
| MAY 8 | 5.13 | 96 | 91 | 84 | 78 | 71 | 59 | 48 | 32 | 0 | 0 | 0 | 0 |
| MAY 15 | (4.82) | 90 | 77 | 71 | 64 | 57 | 52 | 44 | 31 | 6 | 0 | 0 | 0 |
| MAY 22 | 4.96 | 95 | 88 | 82 | 76 | 64 | 49 | 35 | 26 | 0 | 0 | 0 | 0 |
| MAY 29 | 5.19 | 95 | 92 | 87 | 79 | 67 | 57 | 39 | 23 | 0 | 0 | 0 | 0 |
| JUN 5 | 4.56 | 95 | 88 | 77 | 70 | 60 | 52 | 29 | 15 | 0 | 0 | 0 | 0 |
| JUN 12 | 4.23 | 94 | 82 | 76 | 66 | 51 | 34 | 21 | 11 | 0 | 0 | 0 | 0 |
| JUN 19 | 4.77 | 94 | 87 | 79 | 66 | 56 | 48 | 32 | 10 | 0 | 0 | 0 | 0 |
| JUN 26 | (5.17) | 96 | 89 | 84 | 74 | 70 | 56 | 39 | 16 | 0 | 0 | 0 | 0 |
| JUL 3 | | | | | | | | | | | | | |
| JUL 10 | | | | | | | | | | | | | |
| JUL 17 | | | | | | | | | | | | | |
| JUL 24 | | | | | | | | | | | | | |
| JUL 31 | (4.62) | 95 | 87 | 76 | 68 | 56 | 50 | 31 | 24 | 7 | 0 | 0 | 0 |
| AUG 7 | 4.82 | 95 | 89 | 78 | 70 | 59 | 51 | 38 | 26 | 8 | 0 | 0 | 0 |
| AUG 14 | 4.77 | 93 | 86 | 78 | 70 | 63 | 56 | 48 | 38 | 16 | 0 | 0 | 0 |
| AUG 21 | 3.01 | 78 | 51 | 47 | 39 | 31 | 25 | 19 | 13 | 0 | 0 | 0 | 0 |
| AUG 28 | 3.78 | 92 | 84 | 70 | 56 | 35 | 27 | 22 | 19 | 7 | 0 | 0 | 0 |
| SEP 4 | 4.63 | 87 | 78 | 73 | 68 | 61 | 56 | 48 | 37 | 19 | 1 | 0 | 0 |
| SEP 11 | 3.81 | 88 | 71 | 59 | 54 | 47 | 41 | 33 | 26 | 7 | 0 | 0 | 0 |
| SEP 18 | 2.92 | 72 | 53 | 44 | 39 | 32 | 25 | 20 | 17 | 12 | 0 | 0 | 0 |
| SEP 25 | 3.58 | 73 | 60 | 55 | 50 | 47 | 44 | 35 | 30 | 17 | 2 | 0 | 0 |
| OCT 2 | 4.17 | 86 | 78 | 71 | 63 | 53 | 48 | 41 | 29 | 15 | 4 | 0 | 0 |
| OCT 9 | 3.88 | 85 | 66 | 62 | 58 | 50 | 47 | 37 | 31 | 16 | 0 | 0 | 0 |
| OCT 16 | 4.96 | 97 | 88 | 82 | 79 | 71 | 60 | 52 | 39 | 24 | 0 | 0 | 0 |
| OCT 23 | 4.36 | 95 | 84 | 76 | 72 | 67 | 63 | 55 | 41 | 15 | 0 | 0 | 0 |
| OCT 30 | 3.90 | 95 | 89 | 81 | 71 | 62 | 51 | 45 | 40 | 16 | 0 | 0 | 0 |
| NOV 6 | 3.00 | 89 | 79 | 73 | 64 | 51 | 41 | 29 | 15 | 5 | 0 | 0 | 0 |
| NOV 13 | (3.00) | 95 | 84 | 67 | 59 | 46 | 35 | 23 | 12 | 0 | 0 | 0 | 0 |
| NOV 20 | (2.57) | 92 | 71 | 61 | 49 | 43 | 37 | 25 | 20 | 13 | 0 | 0 | 0 |
| NOV 27 | 1.76 | 73 | 51 | 43 | 38 | 28 | 23 | 20 | 15 | 5 | 0 | 0 | 0 |
| DEC 4 | (2.59) | 90 | 73 | 66 | 58 | 50 | 43 | 31 | 15 | 5 | 0 | 0 | 0 |
| DEC 11 | 2.27 | 80 | 58 | 51 | 42 | 30 | 27 | 22 | 15 | 6 | 0 | 0 | 0 |
| DEC 18 | 1.87 | 75 | 45 | 38 | 34 | 24 | 21 | 17 | 12 | 1 | 0 | 0 | 0 |
| DEC 25 | (2.43) | 85 | 58 | 46 | 41 | 36 | 32 | 29 | 21 | 9 | 0 | 0 | 0 |

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | (1.15) | 67 | 38 | 26 | 21 | 12 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAN 30 | 4.33 | 97 | 91 | 81 | 74 | 66 | 52 | 39 | 30 | 17 | 0 | 0 | 0 |
| FEB 6 | 4.31 | 92 | 85 | 79 | 69 | 62 | 58 | 49 | 35 | 20 | 1 | 0 | 0 |
| FEB 13 | 3.45 | 89 | 81 | 66 | 48 | 40 | 36 | 34 | 27 | 14 | 0 | 0 | 0 |
| FEB 20 | 3.19 | 89 | 80 | 68 | 52 | 44 | 32 | 28 | 21 | 15 | 5 | 0 | 0 |
| FEB 27 | 4.48 | 97 | 92 | 87 | 80 | 67 | 52 | 41 | 29 | 15 | 2 | 0 | 0 |
| MAR 6 | 4.23 | 95 | 87 | 76 | 70 | 60 | 51 | 45 | 34 | 23 | 7 | 0 | 0 |
| MAR 13 | 3.50 | 91 | 66 | 58 | 55 | 47 | 39 | 26 | 13 | 6 | 0 | 0 | 0 |
| MAR 20 | 5.47 | 98 | 93 | 88 | 82 | 78 | 71 | 59 | 45 | 28 | 7 | 0 | 0 |
| MAR 27 | 3.51 | 88 | 72 | 62 | 48 | 31 | 24 | 18 | 5 | 2 | 2 | 0 | 0 |
| APR 3 | 5.15 | 97 | 82 | 75 | 69 | 63 | 56 | 44 | 37 | 24 | 2 | 0 | 0 |
| APR 10 | 5.21 | 97 | 92 | 85 | 77 | 66 | 57 | 46 | 34 | 20 | 1 | 0 | 0 |
| APR 17 | 4.86 | 96 | 89 | 80 | 72 | 60 | 51 | 34 | 17 | 2 | 0 | 0 | 0 |
| APR 24 | 5.98 | 97 | 93 | 90 | 84 | 80 | 70 | 56 | 31 | 13 | 0 | 0 | 0 |
| MAY 1 | 5.09 | 96 | 87 | 78 | 71 | 66 | 52 | 43 | 31 | 11 | 2 | 0 | 0 |
| MAY 8 | 4.67 | 94 | 86 | 75 | 66 | 55 | 41 | 34 | 24 | 1 | 0 | 0 | 0 |
| MAY 15 | 2.72 | 82 | 53 | 39 | 27 | 18 | 12 | 7 | 5 | 2 | 0 | 0 | 0 |
| MAY 22 | 4.54 | 91 | 82 | 73 | 62 | 57 | 42 | 36 | 18 | 3 | 0 | 0 | 0 |
| MAY 29 | 5.30 | 96 | 90 | 84 | 75 | 65 | 57 | 41 | 23 | 3 | 0 | 0 | 0 |
| JUN 5 | 4.14 | 92 | 75 | 66 | 58 | 50 | 39 | 31 | 11 | 0 | 0 | 0 | 0 |
| JUN 12 | 4.65 | 93 | 86 | 78 | 67 | 62 | 53 | 41 | 25 | 3 | 0 | 0 | 0 |
| JUN 19 | 5.29 | 95 | 91 | 83 | 76 | 63 | 50 | 36 | 22 | 0 | 0 | 0 | 0 |
| JUN 26 | 5.10 | 95 | 90 | 85 | 74 | 59 | 45 | 33 | 15 | 2 | 0 | 0 | 0 |
| JUL 3 | 4.88 | 96 | 89 | 80 | 68 | 60 | 49 | 35 | 19 | 4 | 0 | 0 | 0 |
| JUL 10 | 4.95 | 94 | 88 | 82 | 75 | 65 | 54 | 42 | 24 | 2 | 0 | 0 | 0 |
| JUL 17 | 5.11 | 96 | 89 | 80 | 75 | 66 | 56 | 43 | 26 | 3 | 0 | 0 | 0 |
| JUL 24 | 5.21 | 95 | 88 | 76 | 68 | 62 | 54 | 40 | 26 | 2 | 0 | 0 | 0 |
| JUL 31 | 4.49 | 92 | 84 | 72 | 64 | 52 | 45 | 32 | 21 | 6 | 0 | 0 | 0 |
| AUG 7 | 4.79 | 88 | 72 | 65 | 60 | 56 | 51 | 43 | 33 | 16 | 0 | 0 | 0 |
| AUG 14 | 4.58 | 92 | 82 | 63 | 56 | 51 | 47 | 38 | 29 | 12 | 0 | 0 | 0 |
| AUG 21 | 4.27 | 95 | 83 | 74 | 66 | 53 | 44 | 35 | 27 | 13 | 2 | 0 | 0 |
| AUG 28 | 4.47 | 92 | 79 | 72 | 66 | 59 | 53 | 41 | 30 | 13 | 3 | 0 | 0 |
| SEP 4 | 5.23 | 96 | 91 | 87 | 79 | 68 | 61 | 49 | 34 | 23 | 0 | 0 | 0 |
| SEP 11 | 4.06 | 85 | 64 | 55 | 50 | 47 | 42 | 37 | 30 | 20 | 0 | 0 | 0 |
| SEP 18 | 4.70 | 92 | 84 | 78 | 73 | 66 | 55 | 49 | 41 | 30 | 9 | 0 | 0 |
| SEP 25 | 2.90 | 65 | 51 | 40 | 36 | 32 | 27 | 22 | 19 | 14 | 1 | 0 | 0 |
| OCT 2 | 3.12 | 79 | 65 | 57 | 49 | 43 | 32 | 29 | 21 | 12 | 1 | 0 | 0 |
| OCT 9 | 5.02 | 93 | 84 | 76 | 72 | 66 | 60 | 52 | 42 | 27 | 7 | 0 | 0 |
| OCT 16 | 5.12 | 98 | 94 | 89 | 81 | 76 | 69 | 59 | 45 | 20 | 3 | 0 | 0 |
| OCT 23 | 3.37 | 91 | 79 | 73 | 61 | 57 | 49 | 37 | 23 | 14 | 0 | 0 | 0 |
| OCT 30 | 3.69 | 94 | 86 | 82 | 72 | 60 | 55 | 47 | 28 | 16 | 4 | 0 | 0 |
| NOV 6 | 4.75 | 98 | 96 | 92 | 85 | 76 | 66 | 55 | 41 | 21 | 0 | 0 | 0 |
| NOV 13 | (2.36) | 93 | 81 | 67 | 55 | 36 | 31 | 10 | 3 | 0 | 0 | 0 | 0 |
| NOV 20 | (1.64) | 81 | 40 | 27 | 26 | 26 | 14 | 13 | 11 | 5 | 0 | 0 | 0 |
| NOV 27 | (3.71) | 95 | 93 | 84 | 80 | 68 | 56 | 43 | 29 | 12 | 0 | 0 | 0 |
| DEC 4 | (1.68) | 63 | 46 | 40 | 30 | 29 | 19 | 11 | 8 | 0 | 0 | 0 | 0 |
| DEC 11 | (2.27) | 92 | 71 | 62 | 50 | 42 | 37 | 30 | 22 | 2 | 0 | 0 | 0 |
| DEC 18 | (3.54) | 96 | 88 | 74 | 72 | 60 | 54 | 44 | 29 | 2 | 0 | 0 | 0 |
| DEC 25 | (4.81) | 99 | 97 | 94 | 93 | 86 | 82 | 70 | 52 | 12 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HAMILTON,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Foulkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | | | | | | | | | | | | | |
| JAN 30 | | | | | | | | | | | | | |
| FEB 6 | | | | | | | | | | | | | |
| FEB 13 | | | | | | | | | | | | | |
| FEB 20 | | | | | | | | | | | | | |
| FEB 27 | | | | | | | | | | | | | |
| MAR 6 | | | | | | | | | | | | | |
| MAR 13 | (2.64) | 89 | 59 | 50 | 42 | 29 | 21 | 12 | 7 | 7 | 7 | 0 | 0 |
| MAR 20 | 4.16 | 94 | 87 | 79 | 66 | 52 | 42 | 39 | 29 | 20 | 14 | 2 | 0 |
| MAR 27 | 3.13 | 90 | 66 | 49 | 46 | 37 | 28 | 21 | 16 | 11 | 4 | 0 | 0 |
| APR 3 | 5.27 | 95 | 83 | 77 | 69 | 60 | 53 | 48 | 42 | 33 | 18 | 1 | 0 |
| APR 10 | (4.43) | 95 | 80 | 72 | 66 | 57 | 45 | 34 | 24 | 19 | 10 | 3 | 0 |
| APR 17 | 5.93 | 97 | 94 | 88 | 81 | 70 | 61 | 50 | 41 | 28 | 5 | 0 | 0 |
| APR 24 | 5.75 | 97 | 92 | 87 | 83 | 75 | 64 | 52 | 36 | 17 | 0 | 0 | 0 |
| MAY 1 | 3.93 | 92 | 78 | 68 | 57 | 46 | 37 | 30 | 17 | 11 | 3 | 0 | 0 |
| MAY 8 | 4.12 | 94 | 82 | 66 | 52 | 39 | 31 | 28 | 19 | 10 | 0 | 0 | 0 |
| MAY 15 | (3.16) | 85 | 55 | 37 | 26 | 20 | 18 | 14 | 11 | 8 | 2 | 0 | 0 |
| MAY 22 | (3.05) | 90 | 72 | 46 | 36 | 25 | 14 | 10 | 7 | 4 | 2 | 0 | 0 |
| MAY 29 | 5.16 | 95 | 89 | 83 | 70 | 60 | 54 | 41 | 28 | 2 | 0 | 0 | 0 |
| JUN 5 | 3.27 | 87 | 59 | 41 | 34 | 27 | 22 | 14 | 7 | 0 | 0 | 0 | 0 |
| JUN 12 | (4.73) | 95 | 89 | 82 | 70 | 58 | 50 | 40 | 15 | 0 | 0 | 0 | 0 |
| JUN 19 | 4.64 | 94 | 89 | 80 | 69 | 56 | 43 | 31 | 9 | 0 | 0 | 0 | 0 |
| JUN 26 | 4.97 | 95 | 88 | 84 | 76 | 63 | 51 | 36 | 16 | 0 | 0 | 0 | 0 |
| JUL 3 | 3.73 | 90 | 75 | 63 | 50 | 38 | 32 | 26 | 7 | 0 | 0 | 0 | 0 |
| JUL 10 | 4.84 | 95 | 91 | 83 | 73 | 58 | 50 | 30 | 9 | 0 | 0 | 0 | 0 |
| JUL 17 | (3.91) | 92 | 80 | 72 | 62 | 53 | 43 | 33 | 18 | 4 | 0 | 0 | 0 |
| JUL 24 | | | | | | | | | | | | | |
| JUL 31 | | | | | | | | | | | | | |
| AUG 7 | | | | | | | | | | | | | |
| AUG 14 | | | | | | | | | | | | | |
| AUG 21 | | | | | | | | | | | | | |
| AUG 28 | | | | | | | | | | | | | |
| SEP 4 | | | | | | | | | | | | | |
| SEP 11 | (2.82) | 91 | 79 | 62 | 48 | 31 | 22 | 10 | 4 | 2 | 0 | 0 | 0 |
| SEP 18 | 3.74 | 94 | 74 | 65 | 55 | 45 | 40 | 32 | 25 | 10 | 4 | 0 | 0 |
| SEP 25 | 2.76 | 83 | 61 | 47 | 39 | 29 | 22 | 18 | 13 | 10 | 6 | 0 | 0 |
| OCT 2 | 4.41 | 95 | 88 | 79 | 68 | 59 | 53 | 32 | 25 | 18 | 5 | 0 | 0 |
| OCT 9 | 5.14 | 95 | 81 | 76 | 71 | 65 | 58 | 48 | 39 | 27 | 6 | 0 | 0 |
| OCT 16 | 5.49 | 99 | 96 | 93 | 88 | 80 | 71 | 54 | 40 | 21 | 0 | 0 | 0 |
| OCT 23 | 2.22 | 79 | 56 | 47 | 39 | 36 | 23 | 17 | 10 | 4 | 0 | 0 | 0 |
| OCT 30 | 2.44 | 88 | 71 | 54 | 42 | 35 | 29 | 21 | 7 | 4 | 0 | 0 | 0 |
| NOV 6 | (3.86) | 97 | 91 | 82 | 79 | 74 | 68 | 60 | 38 | 25 | 6 | 0 | 0 |
| NOV 13 | (2.11) | 83 | 51 | 46 | 36 | 24 | 21 | 17 | 14 | 7 | 0 | 0 | 0 |
| NOV 20 | 1.80 | 70 | 39 | 28 | 25 | 24 | 22 | 20 | 13 | 11 | 0 | 0 | 0 |
| NOV 27 | 1.21 | 56 | 36 | 34 | 31 | 22 | 17 | 15 | 9 | 6 | 0 | 0 | 0 |
| DEC 4 | .89 | 62 | 35 | 20 | 9 | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 11 | ( .57) | 42 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 18 | 1.74 | 73 | 56 | 37 | 36 | 31 | 26 | 22 | 13 | 2 | 0 | 0 | 0 |
| DEC 25 | (2.97) | 91 | 75 | 65 | 61 | 50 | 45 | 37 | 23 | 3 | 0 | 0 | 0 |

Montana Department of Natural Resources and Conservation
compiled by: Foulkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | | | | | | | | | | | | | |
| JAN 30 | (4.64) | 97 | 94 | 90 | 81 | 73 | 66 | 60 | 42 | 21 | 0 | 0 | 0 |
| FEB 6 | (5.10) | 96 | 92 | 82 | 74 | 68 | 59 | 49 | 42 | 30 | 13 | 0 | 0 |
| FEB 13 | 3.82 | 94 | 81 | 74 | 55 | 45 | 42 | 34 | 29 | 22 | 10 | 0 | 0 |
| FEB 20 | 4.36 | 93 | 81 | 71 | 60 | 50 | 45 | 41 | 37 | 32 | 18 | 0 | 0 |
| FEB 27 | 4.96 | 98 | 93 | 86 | 77 | 67 | 54 | 49 | 33 | 25 | 10 | 0 | 0 |
| MAR 6 | 4.62 | 96 | 91 | 85 | 80 | 68 | 59 | 47 | 33 | 21 | 8 | 0 | 0 |
| MAR 13 | 4.68 | 94 | 83 | 72 | 67 | 62 | 54 | 49 | 40 | 30 | 16 | 2 | 0 |
| MAR 20 | 5.07 | 97 | 85 | 78 | 72 | 62 | 60 | 55 | 40 | 27 | 10 | 0 | 0 |
| MAR 27 | 3.84 | 91 | 75 | 65 | 57 | 44 | 37 | 28 | 17 | 7 | 4 | 0 | 0 |
| APR 3 | 5.79 | 95 | 85 | 80 | 74 | 71 | 67 | 59 | 49 | 34 | 10 | 0 | 0 |
| APR 10 | 5.70 | 94 | 85 | 79 | 74 | 69 | 63 | 57 | 43 | 32 | 10 | 0 | 0 |
| APR 17 | 5.24 | 96 | 88 | 79 | 70 | 61 | 57 | 49 | 36 | 21 | 0 | 0 | 0 |
| APR 24 | 5.87 | 97 | 94 | 88 | 80 | 75 | 69 | 54 | 37 | 19 | 0 | 0 | 0 |
| MAY 1 | 4.76 | 95 | 85 | 75 | 68 | 59 | 51 | 42 | 28 | 17 | 0 | 0 | 0 |
| MAY 8 | 5.48 | 96 | 92 | 85 | 80 | 72 | 62 | 50 | 40 | 15 | 1 | 0 | 0 |
| MAY 15 | 3.26 | 79 | 61 | 49 | 36 | 29 | 20 | 17 | 11 | 3 | 0 | 0 | 0 |
| MAY 22 | 3.61 | 90 | 75 | 64 | 52 | 40 | 27 | 17 | 12 | 4 | 0 | 0 | 0 |
| MAY 29 | (5.50) | 94 | 90 | 85 | 82 | 74 | 49 | 37 | 22 | 0 | 0 | 0 | 0 |
| JUN 5 | (5.25) | 96 | 90 | 85 | 81 | 74 | 64 | 47 | 24 | 0 | 0 | 0 | 0 |
| JUN 12 | | | | | | | | | | | | | |
| JUN 19 | | | | | | | | | | | | | |
| JUN 26 | | | | | | | | | | | | | |
| JUL 3 | (4.55) | 94 | 83 | 73 | 65 | 58 | 52 | 40 | 24 | 6 | 0 | 0 | 0 |
| JUL 10 | 4.94 | 94 | 88 | 78 | 70 | 63 | 53 | 43 | 26 | 3 | 0 | 0 | 0 |
| JUL 17 | 4.38 | 92 | 81 | 69 | 64 | 56 | 47 | 41 | 26 | 6 | 0 | 0 | 0 |
| JUL 24 | 4.90 | 94 | 89 | 81 | 72 | 63 | 56 | 43 | 25 | 11 | 1 | 0 | 0 |
| JUL 31 | 4.52 | 87 | 75 | 70 | 62 | 56 | 49 | 42 | 31 | 10 | 0 | 0 | 0 |
| AUG 7 | 5.21 | 95 | 88 | 82 | 77 | 66 | 53 | 44 | 38 | 17 | 0 | 0 | 0 |
| AUG 14 | 5.39 | 94 | 91 | 86 | 78 | 68 | 62 | 50 | 38 | 18 | 0 | 0 | 0 |
| AUG 21 | 4.27 | 94 | 84 | 73 | 62 | 56 | 47 | 36 | 26 | 16 | 4 | 0 | 0 |
| AUG 28 | 4.65 | 91 | 85 | 74 | 64 | 54 | 46 | 35 | 25 | 18 | 2 | 0 | 0 |
| SEP 4 | 6.07 | 98 | 94 | 91 | 87 | 80 | 73 | 63 | 47 | 25 | 0 | 0 | 0 |
| SEP 11 | 4.07 | 86 | 71 | 63 | 58 | 46 | 41 | 34 | 28 | 20 | 6 | 0 | 0 |
| SEP 18 | 4.63 | 91 | 81 | 74 | 69 | 58 | 47 | 34 | 31 | 24 | 13 | 2 | 0 |
| SEP 25 | 3.88 | 91 | 78 | 70 | 63 | 59 | 49 | 42 | 37 | 19 | 13 | 2 | 0 |
| OCT 2 | 3.69 | 84 | 70 | 61 | 57 | 53 | 43 | 36 | 22 | 8 | 2 | 0 | 0 |
| OCT 9 | 4.73 | 82 | 76 | 68 | 62 | 59 | 53 | 45 | 35 | 25 | 4 | 0 | 0 |
| OCT 16 | 5.33 | 97 | 94 | 91 | 85 | 75 | 64 | 54 | 42 | 23 | 0 | 0 | 0 |
| OCT 23 | (4.72) | 97 | 91 | 90 | 82 | 76 | 70 | 66 | 53 | 24 | 0 | 0 | 0 |
| OCT 30 | | | | | | | | | | | | | |
| NOV 6 | (1.67) | 83 | 55 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOV 13 | 2.13 | 86 | 59 | 47 | 35 | 23 | 19 | 9 | 2 | 0 | 0 | 0 | 0 |
| NOV 20 | 2.32 | 82 | 56 | 37 | 34 | 32 | 27 | 23 | 10 | 5 | 0 | 0 | 0 |
| NOV 27 | 3.38 | 84 | 75 | 70 | 66 | 57 | 49 | 40 | 28 | 15 | 0 | 0 | 0 |
| DEC 4 | 2.13 | 74 | 47 | 40 | 37 | 34 | 28 | 22 | 12 | 7 | 0 | 0 | 0 |
| DEC 11 | 2.46 | 82 | 68 | 56 | 48 | 40 | 32 | 19 | 14 | 7 | 0 | 0 | 0 |
| DEC 18 | 2.82 | 79 | 68 | 62 | 50 | 43 | 36 | 29 | 25 | 18 | 0 | 0 | 0 |
| DEC 25 | (3.76) | 90 | 68 | 63 | 59 | 58 | 54 | 46 | 36 | 24 | 0 | 0 | 0 |

# SOLAR RADIATION DATA for: HAVRE, MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | | | | | | | | | | | | | |
| JAN 30 | | | | | | | | | | | | | |
| FEB 6 | (4.70) | 94 | 87 | 75 | 70 | 67 | 64 | 54 | 48 | 31 | 11 | 0 | 0 |
| FEB 13 | 3.44 | 94 | 77 | 70 | 56 | 46 | 43 | 32 | 25 | 6 | 0 | 0 | 0 |
| FEB 20 | 3.93 | 94 | 89 | 82 | 69 | 60 | 50 | 42 | 32 | 20 | 9 | 0 | 0 |
| FEB 27 | 5.32 | 98 | 93 | 88 | 82 | 76 | 68 | 58 | 45 | 34 | 14 | 0 | 0 |
| MAR 6 | 4.73 | 97 | 89 | 83 | 76 | 66 | 62 | 54 | 41 | 23 | 12 | 0 | 0 |
| MAR 13 | 5.04 | 94 | 84 | 76 | 73 | 67 | 63 | 55 | 44 | 29 | 16 | 0 | 0 |
| MAR 20 | (4.26) | 96 | 87 | 70 | 59 | 45 | 38 | 30 | 22 | 13 | 4 | 0 | 0 |
| MAR 27 | (3.80) | 87 | 70 | 48 | 37 | 35 | 33 | 28 | 21 | 18 | 8 | 3 | 0 |
| APR 3 | | | | | | | | | | | | | |
| APR 10 | (7.11) | 98 | 95 | 93 | 91 | 84 | 76 | 76 | 66 | 54 | 21 | 0 | 0 |
| APR 17 | (4.47) | 94 | 87 | 75 | 65 | 53 | 47 | 36 | 21 | 16 | 0 | 0 | 0 |
| APR 24 | 5.99 | 97 | 94 | 90 | 86 | 80 | 71 | 57 | 41 | 10 | 0 | 0 | 0 |
| MAY 1 | (3.96) | 92 | 80 | 69 | 58 | 48 | 40 | 31 | 16 | 3 | 0 | 0 | 0 |
| MAY 8 | (5.54) | 96 | 92 | 88 | 80 | 74 | 65 | 45 | 34 | 7 | 2 | 0 | 0 |
| MAY 15 | (2.53) | 47 | 45 | 42 | 40 | 30 | 22 | 4 | 0 | 0 | 0 | 0 | 0 |
| MAY 22 | (4.28) | 89 | 80 | 74 | 65 | 57 | 49 | 35 | 21 | 7 | 1 | 0 | 0 |
| MAY 29 | 5.67 | 95 | 91 | 88 | 84 | 76 | 63 | 46 | 32 | 6 | 0 | 0 | 0 |
| JUN 5 | 4.69 | 93 | 82 | 70 | 63 | 54 | 46 | 34 | 22 | 0 | 0 | 0 | 0 |
| JUN 12 | (3.96) | 87 | 69 | 64 | 57 | 49 | 43 | 34 | 22 | 4 | 0 | 0 | 0 |
| JUN 19 | (5.10) | 94 | 90 | 87 | 78 | 66 | 49 | 33 | 13 | 0 | 0 | 0 | 0 |
| JUN 26 | 4.63 | 93 | 85 | 77 | 70 | 63 | 50 | 33 | 12 | 0 | 0 | 0 | 0 |
| JUL 3 | 4.75 | 94 | 89 | 83 | 71 | 60 | 49 | 36 | 21 | 3 | 0 | 0 | 0 |
| JUL 10 | 4.09 | 86 | 73 | 63 | 56 | 51 | 43 | 33 | 18 | 0 | 0 | 0 | 0 |
| JUL 17 | 5.26 | 94 | 90 | 85 | 81 | 77 | 65 | 49 | 31 | 1 | 0 | 0 | 0 |
| JUL 24 | 4.36 | 89 | 76 | 70 | 61 | 50 | 42 | 31 | 17 | 0 | 0 | 0 | 0 |
| JUL 31 | 4.66 | 91 | 82 | 72 | 65 | 56 | 45 | 36 | 25 | 6 | 0 | 0 | 0 |
| AUG 7 | 4.31 | 90 | 74 | 65 | 57 | 46 | 40 | 35 | 29 | 6 | 0 | 0 | 0 |
| AUG 14 | 4.31 | 88 | 77 | 67 | 63 | 55 | 48 | 40 | 25 | 11 | 0 | 0 | 0 |
| AUG 21 | (5.52) | 96 | 89 | 81 | 78 | 69 | 65 | 53 | 39 | 8 | 0 | 0 | 0 |
| AUG 28 | (4.46) | 95 | 86 | 81 | 75 | 63 | 55 | 45 | 26 | 16 | 4 | 0 | 0 |
| SEP 4 | 5.04 | 96 | 89 | 80 | 74 | 65 | 59 | 54 | 45 | 35 | 4 | 0 | 0 |
| SEP 11 | 3.65 | 70 | 58 | 52 | 46 | 40 | 37 | 31 | 24 | 13 | 0 | 0 | 0 |
| SEP 18 | 4.12 | 88 | 78 | 72 | 61 | 56 | 50 | 37 | 31 | 22 | 4 | 2 | 0 |
| SEP 25 | 2.72 | 51 | 41 | 39 | 37 | 34 | 29 | 27 | 21 | 16 | 6 | 0 | 0 |
| OCT 2 | 3.70 | 95 | 89 | 81 | 71 | 58 | 42 | 30 | 20 | 13 | 2 | 0 | 0 |
| OCT 9 | 5.31 | 97 | 93 | 85 | 80 | 71 | 61 | 51 | 42 | 27 | 0 | 0 | 0 |
| OCT 16 | 5.22 | 98 | 95 | 88 | 78 | 69 | 61 | 54 | 42 | 24 | 2 | 0 | 0 |
| OCT 23 | 3.97 | 93 | 86 | 78 | 68 | 58 | 45 | 35 | 29 | 14 | 0 | 0 | 0 |
| OCT 30 | 3.80 | 88 | 81 | 75 | 69 | 61 | 52 | 37 | 31 | 18 | 0 | 0 | 0 |
| NOV 6 | 4.65 | 98 | 93 | 90 | 86 | 77 | 66 | 59 | 46 | 22 | 0 | 0 | 0 |
| NOV 13 | (2.40) | 82 | 66 | 50 | 41 | 33 | 24 | 22 | 16 | 3 | 0 | 0 | 0 |
| NOV 20 | (1.90) | 78 | 35 | 27 | 25 | 21 | 20 | 18 | 16 | 8 | 0 | 0 | 0 |
| NOV 27 | (2.88) | 82 | 71 | 67 | 59 | 49 | 46 | 43 | 38 | 23 | 0 | 0 | 0 |
| DEC 4 | (2.35) | 80 | 63 | 53 | 53 | 42 | 32 | 26 | 21 | 0 | 0 | 0 | 0 |
| DEC 11 | (1.92) | 79 | 59 | 54 | 45 | 40 | 24 | 16 | 14 | 9 | 0 | 0 | 0 |
| DEC 18 | 2.40 | 82 | 67 | 53 | 46 | 43 | 37 | 26 | 16 | 4 | 0 | 0 | 0 |
| DEC 25 | (3.11) | 78 | 74 | 70 | 64 | 62 | 51 | 34 | 6 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HELENA, MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | (2.95) | 97 | 91 | 75 | 68 | 60 | 51 | 40 | 15 | 0 | 0 | 0 | 0 |
| JAN 2 | 2.04 | 76 | 50 | 46 | 36 | 27 | 19 | 12 | 8 | 4 | 0 | 0 | 0 |
| JAN 9 | 1.65 | 84 | 51 | 37 | 23 | 20 | 14 | 14 | 5 | 2 | 2 | 0 | 0 |
| JAN 16 | 2.76 | 92 | 73 | 63 | 54 | 46 | 35 | 32 | 24 | 16 | 4 | 0 | 0 |
| JAN 23 | (3.25) | 93 | 83 | 75 | 63 | 54 | 40 | 31 | 17 | 10 | 0 | 0 | 0 |
| JAN 30 | (3.86) | 93 | 86 | 75 | 67 | 58 | 47 | 35 | 26 | 11 | 0 | 0 | 0 |
| FEB 6 | 4.10 | 85 | 78 | 72 | 66 | 57 | 52 | 48 | 37 | 20 | 6 | 0 | 0 |
| FEB 13 | 4.82 | 96 | 93 | 86 | 76 | 66 | 59 | 50 | 39 | 24 | 12 | 0 | 0 |
| FEB 20 | (4.29) | 97 | 92 | 84 | 73 | 60 | 49 | 38 | 30 | 21 | 11 | 0 | 0 |
| FEB 27 | 3.31 | 87 | 71 | 61 | 45 | 38 | 31 | 24 | 16 | 11 | 7 | 0 | 0 |
| MAR 6 | (4.69) | 96 | 85 | 77 | 70 | 62 | 54 | 47 | 40 | 28 | 9 | 0 | 0 |
| MAR 13 | (3.63) | 93 | 74 | 58 | 49 | 43 | 36 | 26 | 18 | 12 | 2 | 0 | 0 |
| MAR 20 | 3.86 | 95 | 80 | 68 | 53 | 43 | 34 | 25 | 18 | 9 | 3 | 0 | 0 |
| MAR 27 | 3.34 | 90 | 72 | 56 | 46 | 40 | 29 | 25 | 20 | 6 | 0 | 0 | 0 |
| APR 3 | 4.59 | 94 | 83 | 72 | 60 | 50 | 46 | 41 | 35 | 17 | 0 | 0 | 0 |
| APR 10 | 5.23 | 97 | 91 | 84 | 76 | 66 | 53 | 46 | 32 | 11 | 1 | 0 | 0 |
| APR 17 | (5.64) | 97 | 94 | 89 | 82 | 77 | 69 | 55 | 32 | 21 | 0 | 0 | 0 |
| APR 24 | (5.12) | 96 | 93 | 85 | 76 | 68 | 55 | 42 | 22 | 2 | 0 | 0 | 0 |
| MAY 1 | 3.99 | 92 | 75 | 68 | 60 | 52 | 34 | 24 | 16 | 7 | 2 | 0 | 0 |
| MAY 8 | (4.10) | 94 | 85 | 78 | 66 | 55 | 39 | 28 | 15 | 1 | 0 | 0 | 0 |
| MAY 15 | (2.47) | 83 | 56 | 39 | 25 | 22 | 10 | 5 | 0 | 0 | 0 | 0 | 0 |
| MAY 22 | (3.52) | 91 | 67 | 56 | 38 | 31 | 24 | 17 | 17 | 10 | 4 | 0 | 0 |
| MAY 29 | 5.22 | 95 | 91 | 87 | 81 | 75 | 66 | 51 | 37 | 4 | 0 | 0 | 0 |
| JUN 5 | (3.61) | 83 | 51 | 46 | 41 | 36 | 31 | 25 | 21 | 3 | 0 | 0 | 0 |
| JUN 12 | 4.68 | 94 | 85 | 79 | 69 | 62 | 50 | 42 | 29 | 3 | 0 | 0 | 0 |
| JUN 19 | (4.96) | 93 | 86 | 78 | 71 | 63 | 51 | 36 | 11 | 0 | 0 | 0 | 0 |
| JUN 26 | | | | | | | | | | | | | |
| JUL 3 | | | | | | | | | | | | | |
| JUL 10 | | | | | | | | | | | | | |
| JUL 17 | (5.42) | 96 | 91 | 86 | 80 | 75 | 64 | 51 | 37 | 5 | 0 | 0 | 0 |
| JUL 24 | 4.68 | 93 | 86 | 80 | 66 | 56 | 46 | 32 | 17 | 0 | 0 | 0 | 0 |
| JUL 31 | 4.84 | 92 | 79 | 73 | 67 | 63 | 55 | 48 | 35 | 0 | 0 | 0 | 0 |
| AUG 7 | (5.01) | 95 | 87 | 75 | 64 | 56 | 44 | 37 | 28 | 9 | 0 | 0 | 0 |
| AUG 14 | 5.96 | 96 | 94 | 89 | 86 | 82 | 74 | 66 | 50 | 17 | 0 | 0 | 0 |
| AUG 21 | 4.07 | 93 | 84 | 73 | 60 | 46 | 35 | 25 | 16 | 4 | 0 | 0 | 0 |
| AUG 28 | 4.18 | 86 | 80 | 73 | 63 | 56 | 47 | 34 | 20 | 8 | 0 | 0 | 0 |
| SEP 4 | 5.98 | 97 | 94 | 90 | 83 | 76 | 70 | 62 | 50 | 28 | 4 | 0 | 0 |
| SEP 11 | 4.00 | 83 | 69 | 61 | 53 | 48 | 44 | 36 | 30 | 14 | 0 | 0 | 0 |
| SEP 18 | 4.39 | 96 | 81 | 71 | 65 | 55 | 47 | 37 | 25 | 14 | 7 | 0 | 0 |
| SEP 25 | 3.20 | 89 | 75 | 58 | 44 | 40 | 31 | 27 | 19 | 12 | 6 | 0 | 0 |
| OCT 2 | 3.82 | 95 | 86 | 76 | 71 | 59 | 48 | 41 | 25 | 16 | 2 | 0 | 0 |
| OCT 9 | 5.22 | 96 | 88 | 79 | 74 | 70 | 62 | 53 | 37 | 16 | 6 | 0 | 0 |
| OCT 16 | 5.88 | 98 | 97 | 92 | 88 | 81 | 73 | 61 | 46 | 23 | 0 | 0 | 0 |
| OCT 23 | 3.41 | 89 | 84 | 73 | 61 | 51 | 40 | 27 | 16 | 6 | 0 | 0 | 0 |
| OCT 30 | (4.41) | 98 | 93 | 90 | 83 | 78 | 61 | 47 | 35 | 18 | 7 | 0 | 0 |
| NOV 6 | 4.04 | 92 | 85 | 71 | 67 | 59 | 50 | 45 | 37 | 22 | 4 | 0 | 0 |
| NOV 13 | 1.82 | 65 | 44 | 39 | 34 | 26 | 20 | 16 | 8 | 5 | 0 | 0 | 0 |
| NOV 20 | 2.59 | 80 | 61 | 49 | 46 | 42 | 38 | 33 | 23 | 12 | 3 | 0 | 0 |
| NOV 27 | 2.23 | 77 | 69 | 57 | 47 | 37 | 30 | 28 | 20 | 6 | 0 | 0 | 0 |
| DEC 4 | 1.85 | 86 | 63 | 57 | 41 | 28 | 17 | 15 | 9 | 6 | 2 | 0 | 0 |
| DEC 11 | 1.21 | 64 | 39 | 27 | 23 | 17 | 13 | 7 | 7 | 3 | 0 | 0 | 0 |
| DEC 18 | (3.44) | 90 | 77 | 68 | 61 | 53 | 45 | 41 | 35 | 26 | 4 | 0 | 0 |
| DEC 25 | (3.32) | 92 | 74 | 69 | 61 | 54 | 44 | 38 | 34 | 24 | 2 | 0 | 0 |

SOLAR RADIATION DATA for: KALISPELL,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | | | | | | | | | | | | | |
| JAN 30 | (1.75) | 58 | 31 | 28 | 25 | 21 | 16 | 13 | 7 | 4 | 0 | 0 | 0 |
| FEB 6 | (1.24) | 73 | 42 | 29 | 13 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FEB 13 | 4.61 | 95 | 83 | 77 | 70 | 66 | 59 | 48 | 37 | 23 | 0 | 0 | 0 |
| FEB 20 | 2.88 | 92 | 71 | 56 | 44 | 39 | 27 | 22 | 17 | 8 | 1 | 0 | 0 |
| FEB 27 | 2.30 | 79 | 56 | 41 | 32 | 23 | 18 | 14 | 12 | 8 | 2 | 0 | 0 |
| MAR 6 | 3.08 | 83 | 67 | 57 | 48 | 38 | 32 | 27 | 19 | 14 | 1 | 0 | 0 |
| MAR 13 | 2.75 | 90 | 72 | 55 | 40 | 28 | 21 | 10 | 4 | 0 | 0 | 0 | 0 |
| MAR 20 | (2.97) | 85 | 60 | 48 | 43 | 38 | 31 | 20 | 19 | 8 | 2 | 0 | 0 |
| MAR 27 | (3.72) | 89 | 74 | 63 | 51 | 40 | 31 | 25 | 17 | 14 | 3 | 0 | 0 |
| APR 3 | 6.04 | 97 | 94 | 90 | 87 | 78 | 68 | 56 | 47 | 31 | 0 | 0 | 0 |
| APR 10 | 3.46 | 93 | 75 | 56 | 47 | 36 | 28 | 21 | 15 | 6 | 0 | 0 | 0 |
| APR 17 | 5.04 | 96 | 89 | 77 | 67 | 62 | 50 | 40 | 31 | 17 | 0 | 0 | 0 |
| APR 24 | 5.93 | 97 | 93 | 88 | 81 | 72 | 61 | 50 | 40 | 28 | 1 | 0 | 0 |
| MAY 1 | 3.95 | 89 | 76 | 62 | 57 | 41 | 33 | 23 | 18 | 7 | 0 | 0 | 0 |
| MAY 8 | 3.82 | 90 | 71 | 62 | 54 | 46 | 41 | 26 | 18 | 5 | 0 | 0 | 0 |
| MAY 15 | 3.33 | 92 | 74 | 61 | 49 | 35 | 22 | 11 | 5 | 3 | 0 | 0 | 0 |
| MAY 22 | 4.02 | 94 | 80 | 71 | 55 | 43 | 34 | 27 | 18 | 5 | 0 | 0 | 0 |
| MAY 29 | 4.48 | 92 | 80 | 69 | 59 | 47 | 42 | 30 | 17 | 3 | 0 | 0 | 0 |
| JUN 5 | 4.15 | 90 | 72 | 60 | 55 | 45 | 37 | 24 | 12 | 0 | 0 | 0 | 0 |
| JUN 12 | 5.10 | 95 | 88 | 81 | 73 | 63 | 52 | 39 | 23 | 0 | 0 | 0 | 0 |
| JUN 19 | (5.46) | 94 | 87 | 79 | 68 | 59 | 51 | 38 | 22 | 2 | 0 | 0 | 0 |
| JUN 26 | (5.26) | 95 | 92 | 87 | 81 | 71 | 57 | 36 | 5 | 0 | 0 | 0 | 0 |
| JUL 3 | 4.01 | 93 | 79 | 58 | 49 | 40 | 36 | 26 | 15 | 4 | 0 | 0 | 0 |
| JUL 10 | 4.57 | 92 | 82 | 72 | 59 | 49 | 38 | 27 | 13 | 2 | 0 | 0 | 0 |
| JUL 17 | (2.15) | 54 | 43 | 30 | 20 | 10 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| JUL 24 | | | | | | | | | | | | | |
| JUL 31 | (4.98) | 92 | 86 | 76 | 72 | 65 | 60 | 51 | 40 | 11 | 0 | 0 | 0 |
| AUG 7 | 5.69 | 96 | 92 | 87 | 83 | 76 | 67 | 58 | 42 | 18 | 0 | 0 | 0 |
| AUG 14 | 6.23 | 97 | 94 | 91 | 86 | 77 | 73 | 61 | 47 | 24 | 0 | 0 | 0 |
| AUG 21 | 2.97 | 81 | 60 | 53 | 41 | 34 | 28 | 19 | 8 | 0 | 0 | 0 | 0 |
| AUG 28 | 3.66 | 87 | 72 | 63 | 58 | 51 | 43 | 34 | 22 | 10 | 6 | 0 | 0 |
| SEP 4 | 5.40 | 95 | 90 | 86 | 78 | 68 | 63 | 54 | 44 | 27 | 2 | 0 | 0 |
| SEP 11 | (4.08) | 91 | 79 | 67 | 55 | 48 | 33 | 27 | 22 | 13 | 0 | 0 | 0 |
| SEP 18 | (2.69) | 86 | 71 | 54 | 43 | 35 | 22 | 17 | 10 | 2 | 0 | 0 | 0 |
| SEP 25 | 1.86 | 57 | 38 | 33 | 25 | 21 | 18 | 13 | 8 | 3 | 0 | 0 | 0 |
| OCT 2 | (3.82) | 88 | 76 | 67 | 60 | 52 | 44 | 30 | 21 | 3 | 0 | 0 | 0 |
| OCT 9 | 4.80 | 94 | 82 | 77 | 69 | 61 | 57 | 49 | 41 | 22 | 0 | 0 | 0 |
| OCT 16 | 4.97 | 98 | 94 | 89 | 83 | 77 | 67 | 55 | 35 | 12 | 0 | 0 | 0 |
| OCT 23 | 2.50 | 86 | 68 | 55 | 48 | 47 | 34 | 26 | 19 | 11 | 2 | 0 | 0 |
| OCT 30 | (2.21) | 66 | 52 | 51 | 48 | 43 | 33 | 28 | 16 | 4 | 0 | 0 | 0 |
| NOV 6 | (3.32) | 93 | 80 | 76 | 68 | 61 | 46 | 28 | 19 | 10 | 0 | 0 | 0 |
| NOV 13 | (1.76) | 60 | 42 | 34 | 28 | 20 | 15 | 14 | 4 | 0 | 0 | 0 | 0 |
| NOV 20 | (2.84) | 78 | 48 | 46 | 44 | 42 | 36 | 32 | 24 | 16 | 3 | 0 | 0 |
| NOV 27 | (2.22) | 78 | 65 | 58 | 52 | 47 | 44 | 33 | 30 | 16 | 0 | 0 | 0 |
| DEC 4 | 1.49 | 66 | 43 | 32 | 30 | 22 | 13 | 12 | 10 | 7 | 0 | 0 | 0 |
| DEC 11 | (1.73) | 51 | 47 | 42 | 42 | 38 | 28 | 22 | 18 | 0 | 0 | 0 | 0 |
| DEC 18 | (1.45) | 60 | 48 | 33 | 27 | 18 | 10 | 5 | 0 | 0 | 0 | 0 | 0 |
| DEC 25 | (2.07) | 62 | 33 | 24 | 23 | 23 | 20 | 17 | 16 | 12 | 0 | 0 | 0 |

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | | | | | | | | | | | | | |
| JAN 30 | | | | | | | | | | | | | |
| FEB 6 | (4.41) | 92 | 69 | 62 | 58 | 53 | 52 | 48 | 42 | 33 | 5 | 0 | 0 |
| FEB 13 | 3.42 | 93 | 74 | 66 | 54 | 43 | 37 | 30 | 25 | 13 | 0 | 0 | 0 |
| FEB 20 | 4.28 | 94 | 69 | 62 | 59 | 55 | 53 | 49 | 39 | 26 | 16 | 0 | 0 |
| FEB 27 | 5.52 | 98 | 94 | 90 | 80 | 76 | 69 | 57 | 46 | 28 | 8 | 0 | 0 |
| MAR 6 | 4.21 | 96 | 87 | 77 | 64 | 57 | 44 | 34 | 28 | 17 | 7 | 0 | 0 |
| MAR 13 | 4.13 | 96 | 82 | 72 | 60 | 53 | 45 | 36 | 24 | 18 | 8 | 0 | 0 |
| MAR 20 | 4.68 | 97 | 90 | 78 | 64 | 55 | 47 | 40 | 35 | 14 | 5 | 0 | 0 |
| MAR 27 | 4.27 | 95 | 84 | 70 | 58 | 46 | 37 | 35 | 31 | 23 | 15 | 2 | 0 |
| APR 3 | 5.64 | 95 | 87 | 78 | 74 | 68 | 60 | 52 | 42 | 30 | 3 | 0 | 0 |
| APR 10 | (5.13) | 95 | 84 | 75 | 65 | 59 | 50 | 44 | 37 | 20 | 0 | 0 | 0 |
| APR 17 | 4.99 | 96 | 89 | 82 | 72 | 61 | 51 | 39 | 30 | 11 | 1 | 0 | 0 |
| APR 24 | 6.12 | 97 | 94 | 91 | 85 | 80 | 72 | 61 | 45 | 15 | 0 | 0 | 0 |
| MAY 1 | 4.75 | 96 | 88 | 80 | 67 | 60 | 50 | 38 | 30 | 12 | 0 | 0 | 0 |
| MAY 8 | 5.60 | 97 | 94 | 88 | 82 | 71 | 61 | 49 | 39 | 4 | 0 | 0 | 0 |
| MAY 15 | 2.73 | 79 | 50 | 36 | 29 | 21 | 17 | 16 | 12 | 4 | 0 | 0 | 0 |
| MAY 22 | 3.93 | 88 | 72 | 64 | 56 | 43 | 34 | 26 | 16 | 3 | 0 | 0 | 0 |
| MAY 29 | 5.81 | 96 | 92 | 88 | 81 | 75 | 67 | 53 | 29 | 2 | 0 | 0 | 0 |
| JUN 5 | 4.40 | 94 | 85 | 73 | 59 | 54 | 43 | 27 | 12 | 0 | 0 | 0 | 0 |
| JUN 12 | 5.06 | 95 | 89 | 81 | 71 | 61 | 53 | 44 | 27 | 3 | 0 | 0 | 0 |
| JUN 19 | 5.25 | 95 | 86 | 82 | 74 | 63 | 52 | 44 | 27 | 3 | 0 | 0 | 0 |
| JUN 26 | 4.81 | 94 | 87 | 78 | 68 | 55 | 41 | 27 | 18 | 5 | 0 | 0 | 0 |
| JUL 3 | 4.55 | 93 | 86 | 78 | 71 | 61 | 53 | 44 | 27 | 4 | 0 | 0 | 0 |
| JUL 10 | (1.88) | 74 | 47 | 26 | 26 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JUL 17 | | | | | | | | | | | | | |
| JUL 24 | (5.99) | 97 | 94 | 91 | 86 | 77 | 67 | 59 | 43 | 6 | 0 | 0 | 0 |
| JUL 31 | 4.06 | 86 | 74 | 64 | 59 | 48 | 37 | 29 | 20 | 3 | 0 | 0 | 0 |
| AUG 7 | 4.63 | 89 | 79 | 70 | 64 | 59 | 47 | 41 | 33 | 6 | 0 | 0 | 0 |
| AUG 14 | 4.84 | 95 | 89 | 85 | 70 | 59 | 52 | 45 | 33 | 15 | 0 | 0 | 0 |
| AUG 21 | 4.24 | 95 | 88 | 81 | 69 | 56 | 43 | 36 | 27 | 13 | 0 | 0 | 0 |
| AUG 28 | (3.87) | 78 | 71 | 61 | 50 | 39 | 35 | 32 | 27 | 19 | 3 | 2 | 0 |
| SEP 4 | (5.47) | 94 | 89 | 81 | 75 | 72 | 62 | 51 | 38 | 16 | 0 | 0 | 0 |
| SEP 11 | 4.31 | 89 | 73 | 62 | 56 | 50 | 40 | 36 | 29 | 15 | 0 | 0 | 0 |
| SEP 18 | 4.62 | 96 | 80 | 76 | 69 | 60 | 53 | 45 | 34 | 22 | 7 | 2 | 0 |
| SEP 25 | 3.86 | 81 | 66 | 63 | 54 | 48 | 39 | 34 | 23 | 11 | 2 | 0 | 0 |
| OCT 2 | 3.94 | 92 | 79 | 73 | 59 | 54 | 49 | 41 | 26 | 6 | 0 | 0 | 0 |
| OCT 9 | 4.71 | 93 | 82 | 76 | 67 | 58 | 51 | 41 | 36 | 23 | 2 | 0 | 0 |
| OCT 16 | 5.54 | 99 | 96 | 92 | 85 | 77 | 68 | 59 | 43 | 22 | 0 | 0 | 0 |
| OCT 23 | 4.14 | 95 | 88 | 81 | 73 | 69 | 57 | 42 | 32 | 10 | 0 | 0 | 0 |
| OCT 30 | 3.50 | 95 | 77 | 71 | 63 | 55 | 47 | 35 | 20 | 6 | 0 | 0 | 0 |
| NOV 6 | 3.97 | 93 | 84 | 79 | 71 | 62 | 54 | 40 | 28 | 14 | 0 | 0 | 0 |
| NOV 13 | (1.98) | 84 | 56 | 48 | 41 | 41 | 29 | 12 | 6 | 3 | 0 | 0 | 0 |
| NOV 20 | 2.32 | 85 | 60 | 50 | 35 | 27 | 24 | 18 | 12 | 4 | 0 | 0 | 0 |
| NOV 27 | (2.89) | 93 | 78 | 67 | 54 | 46 | 38 | 27 | 16 | 0 | 0 | 0 | 0 |
| DEC 4 | 1.89 | 85 | 51 | 44 | 44 | 33 | 26 | 15 | 6 | 0 | 0 | 0 | 0 |
| DEC 11 | (3.14) | 93 | 85 | 76 | 64 | 62 | 49 | 43 | 23 | 13 | 0 | 0 | 0 |
| DEC 18 | (2.96) | 89 | 69 | 53 | 46 | 41 | 31 | 30 | 24 | 10 | 0 | 0 | 0 |
| DEC 25 | (3.22) | 91 | 64 | 57 | 54 | 49 | 42 | 36 | 29 | 13 | 0 | 0 | 0 |

# SOLAR RADIATION DATA for: LIBBY, MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Foulkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | | | | | | | | | | | | | |
| JAN 30 | | | | | | | | | | | | | |
| FEB 6 | (3.16) | 95 | 90 | 71 | 71 | 57 | 31 | 0 | 0 | 0 | 0 | 0 | 0 |
| FEB 13 | 3.55 | 92 | 77 | 75 | 71 | 63 | 58 | 51 | 37 | 21 | 3 | 0 | 0 |
| FEB 20 | 3.44 | 95 | 83 | 74 | 64 | 56 | 49 | 46 | 34 | 23 | 9 | 2 | 0 |
| FEB 27 | (3.34) | 90 | 74 | 66 | 58 | 39 | 37 | 31 | 19 | 12 | 2 | 0 | 0 |
| MAR 6 | 2.81 | 78 | 69 | 64 | 48 | 38 | 30 | 23 | 14 | 10 | 2 | 0 | 0 |
| MAR 13 | 3.18 | 92 | 81 | 69 | 56 | 46 | 39 | 20 | 14 | 4 | 4 | 0 | 0 |
| MAR 20 | (3.60) | 93 | 81 | 69 | 57 | 49 | 33 | 17 | 11 | 5 | 0 | 0 | 0 |
| MAR 27 | 3.69 | 94 | 81 | 67 | 53 | 43 | 29 | 21 | 14 | 8 | 3 | 0 | 0 |
| APR 3 | 6.60 | 98 | 96 | 92 | 89 | 83 | 76 | 68 | 58 | 40 | 7 | 0 | 0 |
| APR 10 | (4.34) | 95 | 83 | 64 | 59 | 56 | 43 | 35 | 27 | 12 | 0 | 0 | 0 |
| APR 17 | (4.55) | 96 | 90 | 79 | 68 | 55 | 47 | 33 | 18 | 4 | 0 | 0 | 0 |
| APR 24 | (5.69) | 95 | 88 | 78 | 72 | 66 | 60 | 52 | 42 | 22 | 1 | 0 | 0 |
| MAY 1 | 3.86 | 90 | 74 | 62 | 58 | 47 | 32 | 24 | 19 | 7 | 0 | 0 | 0 |
| MAY 8 | 3.23 | 92 | 67 | 45 | 34 | 31 | 27 | 19 | 14 | 9 | 0 | 0 | 0 |
| MAY 15 | (3.49) | 92 | 76 | 65 | 51 | 45 | 29 | 14 | 0 | 0 | 0 | 0 | 0 |
| MAY 22 | (3.24) | 88 | 70 | 54 | 35 | 22 | 15 | 14 | 8 | 2 | 0 | 0 | 0 |
| MAY 29 | 3.91 | 91 | 71 | 57 | 46 | 38 | 27 | 20 | 15 | 1 | 0 | 0 | 0 |
| JUN 5 | 4.94 | 95 | 89 | 82 | 75 | 59 | 47 | 33 | 21 | 1 | 0 | 0 | 0 |
| JUN 12 | 4.71 | 94 | 87 | 79 | 69 | 58 | 48 | 31 | 23 | 1 | 0 | 0 | 0 |
| JUN 19 | (5.36) | 95 | 91 | 86 | 80 | 72 | 59 | 46 | 34 | 12 | 0 | 0 | 0 |
| JUN 26 | | | | | | | | | | | | | |
| JUL 3 | | | | | | | | | | | | | |
| JUL 10 | (3.28) | 93 | 84 | 76 | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JUL 17 | (5.28) | 96 | 91 | 86 | 75 | 64 | 53 | 43 | 31 | 9 | 0 | 0 | 0 |
| JUL 24 | 3.67 | 85 | 68 | 56 | 46 | 40 | 31 | 24 | 18 | 6 | 0 | 0 | 0 |
| JUL 31 | 5.10 | 95 | 83 | 76 | 72 | 64 | 56 | 44 | 33 | 8 | 0 | 0 | 0 |
| AUG 7 | 5.83 | 96 | 90 | 86 | 83 | 77 | 69 | 58 | 43 | 19 | 0 | 0 | 0 |
| AUG 14 | 5.95 | 95 | 91 | 86 | 80 | 72 | 65 | 55 | 45 | 24 | 0 | 0 | 0 |
| AUG 21 | | | | | | | | | | | | | |
| AUG 28 | (2.64) | 90 | 77 | 62 | 19 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SEP 4 | 5.37 | 92 | 85 | 83 | 75 | 68 | 62 | 55 | 46 | 31 | 8 | 0 | 0 |
| SEP 11 | 4.33 | 88 | 76 | 70 | 58 | 54 | 46 | 39 | 30 | 18 | 0 | 0 | 0 |
| SEP 18 | (2.84) | 86 | 69 | 61 | 54 | 41 | 24 | 22 | 20 | 11 | 2 | 0 | 0 |
| SEP 25 | 1.94 | 81 | 61 | 44 | 30 | 18 | 9 | 5 | 3 | 3 | 0 | 0 | 0 |
| OCT 2 | (4.10) | 95 | 91 | 86 | 78 | 71 | 59 | 45 | 37 | 15 | 0 | 0 | 0 |
| OCT 9 | 3.95 | 95 | 87 | 76 | 74 | 70 | 60 | 48 | 35 | 14 | 0 | 0 | 0 |
| OCT 16 | (4.56) | 98 | 93 | 86 | 79 | 70 | 64 | 57 | 46 | 15 | 0 | 0 | 0 |
| OCT 23 | 2.45 | 84 | 65 | 50 | 41 | 35 | 26 | 21 | 17 | 12 | 1 | 0 | 0 |
| OCT 30 | (2.43) | 77 | 54 | 47 | 41 | 38 | 34 | 27 | 18 | 6 | 0 | 0 | 0 |
| NOV 6 | (2.36) | 79 | 68 | 64 | 57 | 49 | 38 | 23 | 23 | 10 | 0 | 0 | 0 |
| NOV 13 | (1.03) | 85 | 45 | 10 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOV 20 | (4.42) | 97 | 97 | 95 | 86 | 81 | 69 | 53 | 18 | 0 | 0 | 0 | 0 |
| NOV 27 | (2.02) | 90 | 80 | 76 | 48 | 40 | 40 | 22 | 8 | 0 | 0 | 0 | 0 |
| DEC 4 | | | | | | | | | | | | | |
| DEC 11 | | | | | | | | | | | | | |
| DEC 18 | | | | | | | | | | | | | |
| DEC 25 | | | | | | | | | | | | | |

Montana Department of Natural Resources and Conservation
compiled by: Foulkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | (6.03) | 99 | 99 | 95 | 95 | 88 | 79 | 73 | 67 | 39 | 0 | 0 | 0 |
| JAN 23 | 2.74 | 90 | 64 | 56 | 51 | 40 | 33 | 24 | 17 | 10 | 5 | 2 | 0 |
| JAN 30 | 5.50 | 98 | 97 | 93 | 91 | 83 | 78 | 68 | 49 | 29 | 6 | 0 | 0 |
| FEB 6 | 4.75 | 93 | 81 | 77 | 73 | 67 | 58 | 53 | 44 | 33 | 7 | 0 | 0 |
| FEB 13 | 3.12 | 88 | 79 | 69 | 59 | 56 | 44 | 34 | 22 | 12 | 0 | 0 | 0 |
| FEB 20 | 3.75 | 86 | 72 | 63 | 53 | 46 | 40 | 31 | 26 | 20 | 1 | 0 | 0 |
| FEB 27 | 4.97 | 97 | 92 | 85 | 78 | 70 | 62 | 51 | 42 | 28 | 4 | 0 | 0 |
| MAR 6 | 4.04 | 96 | 84 | 72 | 58 | 46 | 34 | 27 | 18 | 14 | 3 | 0 | 0 |
| MAR 13 | 4.94 | 97 | 92 | 83 | 74 | 65 | 54 | 44 | 33 | 22 | 4 | 0 | 0 |
| MAR 20 | 4.81 | 86 | 80 | 76 | 66 | 62 | 55 | 45 | 31 | 21 | 2 | 0 | 0 |
| MAR 27 | 3.51 | 79 | 68 | 58 | 51 | 44 | 35 | 28 | 20 | 13 | 6 | 0 | 0 |
| APR 3 | 6.23 | 97 | 94 | 91 | 88 | 82 | 72 | 62 | 48 | 30 | 1 | 0 | 0 |
| APR 10 | 6.19 | 98 | 95 | 90 | 86 | 81 | 74 | 63 | 48 | 26 | 0 | 0 | 0 |
| APR 17 | 4.70 | 94 | 79 | 72 | 69 | 61 | 48 | 40 | 26 | 5 | 0 | 0 | 0 |
| APR 24 | 6.08 | 97 | 94 | 90 | 85 | 78 | 69 | 60 | 45 | 13 | 0 | 0 | 0 |
| MAY 1 | 4.44 | 93 | 79 | 70 | 61 | 54 | 47 | 41 | 30 | 11 | 0 | 0 | 0 |
| MAY 8 | 5.07 | 96 | 92 | 82 | 74 | 63 | 51 | 37 | 15 | 3 | 0 | 0 | 0 |
| MAY 15 | 3.40 | 69 | 60 | 50 | 45 | 40 | 32 | 25 | 14 | 1 | 1 | 0 | 0 |
| MAY 22 | 4.88 | 95 | 89 | 84 | 75 | 66 | 57 | 38 | 6 | 0 | 0 | 0 | 0 |
| MAY 29 | 5.59 | 95 | 92 | 87 | 80 | 68 | 59 | 47 | 27 | 1 | 0 | 0 | 0 |
| JUN 5 | 5.02 | 94 | 90 | 84 | 74 | 62 | 50 | 33 | 17 | 0 | 0 | 0 | 0 |
| JUN 12 | (4.76) | 94 | 91 | 82 | 74 | 64 | 54 | 36 | 20 | 0 | 0 | 0 | 0 |
| JUN 19 | | | | | | | | | | | | | |
| JUN 26 | | | | | | | | | | | | | |
| JUL 3 | | | | | | | | | | | | | |
| JUL 10 | | | | | | | | | | | | | |
| JUL 17 | (5.55) | 95 | 93 | 88 | 80 | 72 | 61 | 45 | 23 | 0 | 0 | 0 | 0 |
| JUL 24 | 4.43 | 88 | 79 | 69 | 58 | 50 | 43 | 36 | 20 | 0 | 0 | 0 | 0 |
| JUL 31 | 5.05 | 96 | 91 | 85 | 77 | 69 | 55 | 41 | 23 | 4 | 0 | 0 | 0 |
| AUG 7 | 4.61 | 95 | 86 | 76 | 70 | 56 | 47 | 37 | 18 | 3 | 0 | 0 | 0 |
| AUG 14 | 4.81 | 89 | 82 | 76 | 66 | 62 | 51 | 40 | 30 | 10 | 1 | 0 | 0 |
| AUG 21 | (3.47) | 83 | 65 | 55 | 46 | 39 | 34 | 29 | 19 | 2 | 0 | 0 | 0 |
| AUG 28 | 4.82 | 97 | 89 | 82 | 75 | 67 | 54 | 45 | 34 | 19 | 0 | 0 | 0 |
| SEP 4 | 5.59 | 95 | 90 | 86 | 80 | 73 | 62 | 56 | 44 | 24 | 0 | 0 | 0 |
| SEP 11 | 4.39 | 84 | 75 | 69 | 58 | 54 | 48 | 37 | 28 | 15 | 0 | 0 | 0 |
| SEP 18 | 3.58 | 83 | 69 | 61 | 49 | 41 | 36 | 29 | 18 | 15 | 4 | 0 | 0 |
| SEP 25 | 3.40 | 65 | 57 | 49 | 43 | 37 | 30 | 28 | 25 | 17 | 4 | 0 | 0 |
| OCT 2 | 4.37 | 83 | 81 | 77 | 73 | 68 | 59 | 50 | 39 | 21 | 2 | 0 | 0 |
| OCT 9 | 4.04 | 76 | 66 | 63 | 59 | 56 | 49 | 42 | 34 | 17 | 0 | 0 | 0 |
| OCT 16 | 5.54 | 98 | 94 | 90 | 84 | 76 | 69 | 58 | 44 | 23 | 1 | 0 | 0 |
| OCT 23 | 4.85 | 96 | 91 | 85 | 76 | 73 | 62 | 52 | 43 | 20 | 0 | 0 | 0 |
| OCT 30 | 4.84 | 97 | 94 | 90 | 84 | 77 | 65 | 58 | 45 | 26 | 0 | 0 | 0 |
| NOV 6 | 4.05 | 95 | 83 | 77 | 68 | 59 | 51 | 44 | 34 | 17 | 0 | 0 | 0 |
| NOV 13 | 2.04 | 74 | 54 | 44 | 33 | 29 | 17 | 12 | 6 | 5 | 0 | 0 | 0 |
| NOV 20 | 2.63 | 90 | 71 | 61 | 50 | 36 | 31 | 25 | 19 | 4 | 0 | 0 | 0 |
| NOV 27 | (2.27) | 91 | 70 | 60 | 52 | 49 | 40 | 31 | 15 | 3 | 0 | 0 | 0 |
| DEC 4 | 2.13 | 87 | 56 | 48 | 35 | 24 | 21 | 14 | 8 | 3 | 0 | 0 | 0 |
| DEC 11 | 2.24 | 74 | 66 | 53 | 45 | 38 | 34 | 29 | 18 | 0 | 0 | 0 | 0 |
| DEC 18 | (1.75) | 55 | 33 | 29 | 26 | 22 | 17 | 14 | 11 | 2 | 0 | 0 | 0 |
| DEC 25 | (2.73) | 82 | 50 | 47 | 44 | 41 | 37 | 34 | 28 | 6 | 0 | 0 | 0 |

# SOLAR RADIATION DATA for: MISSOULA,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Foulkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | (1.84) | 92 | 79 | 46 | 40 | 19 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAN 23 | 3.27 | 85 | 70 | 60 | 57 | 54 | 44 | 34 | 20 | 5 | 0 | 0 | 0 |
| JAN 30 | 3.63 | 85 | 80 | 70 | 63 | 53 | 45 | 32 | 21 | 8 | 0 | 0 | 0 |
| FEB 6 | 3.12 | 83 | 72 | 63 | 61 | 49 | 45 | 35 | 26 | 7 | 0 | 0 | 0 |
| FEB 13 | 4.42 | 97 | 88 | 80 | 71 | 63 | 52 | 43 | 36 | 16 | 0 | 0 | 0 |
| FEB 20 | 2.22 | 80 | 51 | 40 | 27 | 19 | 14 | 9 | 8 | 7 | 0 | 0 | 0 |
| FEB 27 | 1.95 | 85 | 52 | 45 | 32 | 25 | 12 | 12 | 8 | 7 | 2 | 0 | 0 |
| MAR 6 | 2.53 | 71 | 46 | 43 | 39 | 34 | 31 | 23 | 19 | 11 | 2 | 0 | 0 |
| MAR 13 | 2.80 | 89 | 71 | 50 | 37 | 29 | 23 | 23 | 15 | 7 | 3 | 0 | 0 |
| MAR 20 | 3.70 | 93 | 68 | 53 | 44 | 40 | 31 | 25 | 20 | 11 | 5 | 0 | 0 |
| MAR 27 | 2.90 | 90 | 66 | 44 | 39 | 25 | 21 | 16 | 13 | 7 | 4 | 0 | 0 |
| APR 3 | 5.87 | 97 | 94 | 89 | 83 | 76 | 67 | 55 | 46 | 36 | 14 | 0 | 0 |
| APR 10 | 4.17 | 95 | 82 | 67 | 56 | 50 | 41 | 33 | 25 | 12 | 4 | 0 | 0 |
| APR 17 | 5.31 | 97 | 91 | 84 | 78 | 67 | 57 | 41 | 27 | 17 | 0 | 0 | 0 |
| APR 24 | 5.88 | 97 | 93 | 89 | 83 | 74 | 69 | 53 | 38 | 17 | 0 | 0 | 0 |
| MAY 1 | 4.02 | 93 | 80 | 66 | 59 | 55 | 47 | 35 | 24 | 14 | 4 | 0 | 0 |
| MAY 8 | 3.83 | 92 | 76 | 58 | 50 | 45 | 32 | 23 | 13 | 6 | 0 | 0 | 0 |
| MAY 15 | 2.56 | 75 | 50 | 37 | 31 | 18 | 13 | 7 | 5 | 2 | 0 | 0 | 0 |
| MAY 22 | 3.46 | 92 | 75 | 62 | 46 | 30 | 17 | 13 | 10 | 4 | 0 | 0 | 0 |
| MAY 29 | (4.53) | 95 | 87 | 78 | 68 | 55 | 40 | 26 | 18 | 3 | 2 | 0 | 0 |
| JUN 5 | 3.72 | 92 | 71 | 56 | 47 | 28 | 22 | 17 | 10 | 0 | 0 | 0 | 0 |
| JUN 12 | 4.55 | 93 | 85 | 79 | 68 | 56 | 47 | 29 | 16 | 3 | 0 | 0 | 0 |
| JUN 19 | 4.93 | 94 | 89 | 83 | 73 | 62 | 50 | 33 | 16 | 1 | 0 | 0 | 0 |
| JUN 26 | 5.60 | 95 | 91 | 87 | 81 | 73 | 62 | 45 | 27 | 2 | 0 | 0 | 0 |
| JUL 3 | 3.45 | 91 | 73 | 59 | 45 | 39 | 29 | 17 | 4 | 0 | 0 | 0 | 0 |
| JUL 10 | (4.84) | 95 | 91 | 83 | 78 | 65 | 54 | 32 | 11 | 0 | 0 | 0 | 0 |
| JUL 17 | 3.82 | 82 | 70 | 59 | 53 | 44 | 39 | 28 | 14 | 1 | 0 | 0 | 0 |
| JUL 24 | 4.06 | 93 | 79 | 64 | 60 | 50 | 36 | 29 | 19 | 4 | 0 | 0 | 0 |
| JUL 31 | 5.46 | 96 | 91 | 83 | 79 | 72 | 60 | 47 | 34 | 9 | 1 | 0 | 0 |
| AUG 7 | 5.87 | 97 | 94 | 89 | 83 | 76 | 72 | 59 | 44 | 16 | 0 | 0 | 0 |
| AUG 14 | 5.77 | 96 | 92 | 87 | 82 | 78 | 70 | 60 | 48 | 15 | 0 | 0 | 0 |
| AUG 21 | 3.03 | 89 | 68 | 49 | 40 | 36 | 31 | 17 | 12 | 5 | 2 | 0 | 0 |
| AUG 28 | (3.24) | 81 | 55 | 51 | 45 | 39 | 33 | 26 | 21 | 10 | 8 | 0 | 0 |
| SEP 4 | (5.80) | 97 | 93 | 90 | 83 | 78 | 72 | 63 | 52 | 35 | 4 | 0 | 0 |
| SEP 11 | (4.26) | 94 | 85 | 77 | 67 | 55 | 49 | 42 | 35 | 23 | 0 | 0 | 0 |
| SEP 18 | 3.67 | 93 | 82 | 73 | 56 | 51 | 43 | 36 | 32 | 20 | 6 | 0 | 0 |
| SEP 25 | 1.55 | 78 | 43 | 26 | 15 | 12 | 8 | 4 | 4 | 0 | 0 | 0 | 0 |
| OCT 2 | 4.04 | 94 | 79 | 63 | 56 | 44 | 35 | 32 | 26 | 21 | 7 | 0 | 0 |
| OCT 9 | 5.09 | 90 | 77 | 73 | 71 | 67 | 62 | 52 | 41 | 26 | 7 | 0 | 0 |
| OCT 16 | 5.43 | 98 | 96 | 92 | 88 | 79 | 70 | 58 | 42 | 13 | 0 | 0 | 0 |
| OCT 23 | (2.62) | 90 | 77 | 73 | 63 | 51 | 36 | 23 | 14 | 10 | 0 | 0 | 0 |
| OCT 30 | 2.70 | 91 | 73 | 65 | 56 | 44 | 37 | 27 | 15 | 6 | 3 | 0 | 0 |
| NOV 6 | (2.25) | 90 | 77 | 67 | 54 | 45 | 34 | 23 | 12 | 0 | 0 | 0 | 0 |
| NOV 13 | 1.82 | 76 | 58 | 46 | 41 | 29 | 23 | 17 | 9 | 7 | 0 | 0 | 0 |
| NOV 20 | (2.37) | 83 | 65 | 57 | 48 | 39 | 34 | 23 | 13 | 0 | 0 | 0 | 0 |
| NOV 27 | (1.86) | 79 | 65 | 51 | 46 | 35 | 35 | 26 | 20 | 6 | 6 | 0 | 0 |
| DEC 4 | .76 | 63 | 29 | 13 | 11 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 11 | (1.09) | 77 | 49 | 29 | 29 | 29 | 29 | 17 | 17 | 17 | 0 | 0 | 0 |
| DEC 18 | (1.94) | 83 | 51 | 34 | 32 | 21 | 18 | 14 | 12 | 0 | 0 | 0 | 0 |
| DEC 25 | (1.62) | 48 | 44 | 40 | 39 | 35 | 30 | 21 | 9 | 3 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: POLSON, MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Foulkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | (2.46) | 86 | 68 | 47 | 39 | 37 | 22 | 16 | 8 | 3 | 0 | 0 | 0 |
| JAN 30 | (1.11) | 16 | 15 | 15 | 15 | 13 | 12 | 10 | 7 | 4 | 0 | 0 | 0 |
| FEB 6 | (1.55) | 66 | 49 | 33 | 33 | 27 | 22 | 17 | 14 | 8 | 8 | 0 | 0 |
| FEB 13 | 4.60 | 91 | 84 | 79 | 73 | 64 | 56 | 50 | 41 | 24 | 4 | 0 | 0 |
| FEB 20 | 2.73 | 88 | 76 | 62 | 48 | 38 | 30 | 22 | 13 | 7 | 4 | 0 | 0 |
| FEB 27 | 2.38 | 88 | 70 | 51 | 38 | 26 | 23 | 20 | 12 | 10 | 6 | 0 | 0 |
| MAR 6 | 2.98 | 81 | 62 | 52 | 45 | 38 | 37 | 37 | 27 | 20 | 15 | 0 | 0 |
| MAR 13 | 2.95 | 91 | 77 | 65 | 54 | 39 | 27 | 16 | 8 | 4 | 0 | 0 | 0 |
| MAR 20 | 3.07 | 75 | 56 | 47 | 40 | 34 | 28 | 22 | 20 | 12 | 6 | 0 | 0 |
| MAR 27 | 3.22 | 92 | 81 | 64 | 53 | 35 | 25 | 15 | 14 | 9 | 3 | 0 | 0 |
| APR 3 | 6.20 | 97 | 95 | 88 | 82 | 77 | 66 | 59 | 48 | 30 | 3 | 0 | 0 |
| APR 10 | 4.06 | 88 | 73 | 64 | 56 | 44 | 42 | 32 | 23 | 12 | 4 | 0 | 0 |
| APR 17 | 5.11 | 95 | 90 | 78 | 71 | 58 | 47 | 43 | 32 | 19 | 0 | 0 | 0 |
| APR 24 | 5.96 | 97 | 94 | 89 | 84 | 75 | 63 | 50 | 37 | 13 | 0 | 0 | 0 |
| MAY 1 | 3.95 | 91 | 79 | 68 | 59 | 49 | 38 | 26 | 21 | 4 | 0 | 0 | 0 |
| MAY 8 | 3.97 | 90 | 76 | 65 | 53 | 43 | 35 | 27 | 17 | 8 | 0 | 0 | 0 |
| MAY 15 | 3.19 | 91 | 69 | 56 | 46 | 31 | 22 | 12 | 4 | 1 | 0 | 0 | 0 |
| MAY 22 | 4.30 | 95 | 86 | 72 | 62 | 51 | 41 | 32 | 18 | 4 | 0 | 0 | 0 |
| MAY 29 | 4.59 | 93 | 82 | 71 | 64 | 58 | 48 | 39 | 23 | 10 | 4 | 0 | 0 |
| JUN 5 | 4.38 | 91 | 77 | 69 | 59 | 49 | 41 | 31 | 12 | 0 | 0 | 0 | 0 |
| JUN 12 | 4.84 | 93 | 86 | 79 | 73 | 62 | 48 | 35 | 15 | 0 | 0 | 0 | 0 |
| JUN 19 | 4.81 | 93 | 88 | 77 | 67 | 57 | 45 | 30 | 14 | 0 | 0 | 0 | 0 |
| JUN 26 | 5.29 | 95 | 91 | 83 | 73 | 62 | 50 | 39 | 21 | 1 | 0 | 0 | 0 |
| JUL 3 | 4.42 | 94 | 85 | 76 | 62 | 49 | 39 | 29 | 18 | 3 | 0 | 0 | 0 |
| JUL 10 | 4.54 | 93 | 83 | 76 | 64 | 53 | 45 | 35 | 25 | 2 | 0 | 0 | 0 |
| JUL 17 | 4.38 | 89 | 77 | 66 | 61 | 55 | 48 | 39 | 26 | 1 | 0 | 0 | 0 |
| JUL 24 | 4.38 | 90 | 78 | 68 | 62 | 52 | 42 | 28 | 19 | 3 | 0 | 0 | 0 |
| JUL 31 | 5.40 | 95 | 92 | 84 | 76 | 70 | 62 | 51 | 39 | 8 | 0 | 0 | 0 |
| AUG 7 | 5.73 | 96 | 93 | 84 | 77 | 70 | 62 | 53 | 37 | 15 | 0 | 0 | 0 |
| AUG 14 | 6.29 | 97 | 95 | 92 | 87 | 81 | 75 | 64 | 50 | 15 | 0 | 0 | 0 |
| AUG 21 | 3.39 | 86 | 71 | 57 | 50 | 40 | 32 | 29 | 18 | 7 | 0 | 0 | 0 |
| AUG 28 | 3.63 | 88 | 79 | 63 | 53 | 45 | 39 | 34 | 26 | 17 | 5 | 0 | 0 |
| SEP 4 | 5.24 | 94 | 86 | 77 | 73 | 66 | 60 | 50 | 40 | 28 | 3 | 0 | 0 |
| SEP 11 | 4.85 | 95 | 85 | 79 | 74 | 67 | 54 | 40 | 28 | 18 | 0 | 0 | 0 |
| SEP 18 | 3.06 | 90 | 79 | 63 | 55 | 38 | 29 | 17 | 11 | 5 | 0 | 0 | 0 |
| SEP 25 | 2.34 | 64 | 55 | 50 | 44 | 33 | 25 | 18 | 13 | 8 | 3 | 0 | 0 |
| OCT 2 | 3.99 | 91 | 83 | 73 | 66 | 57 | 40 | 34 | 27 | 21 | 8 | 0 | 0 |
| OCT 9 | 5.38 | 97 | 93 | 88 | 84 | 75 | 69 | 60 | 46 | 33 | 9 | 0 | 0 |
| OCT 16 | 5.46 | 98 | 96 | 93 | 88 | 79 | 72 | 60 | 46 | 23 | 0 | 0 | 0 |
| OCT 23 | 2.14 | 67 | 55 | 43 | 32 | 30 | 22 | 14 | 9 | 7 | 0 | 0 | 0 |
| OCT 30 | 2.64 | 75 | 59 | 55 | 54 | 40 | 38 | 33 | 27 | 10 | 5 | 0 | 0 |
| NOV 6 | (2.32) | 82 | 69 | 57 | 48 | 45 | 39 | 28 | 20 | 11 | 5 | 0 | 0 |
| NOV 13 | (2.09) | 88 | 75 | 67 | 56 | 47 | 41 | 30 | 30 | 30 | 11 | 0 | 0 |
| NOV 20 | (2.38) | 79 | 51 | 43 | 42 | 39 | 32 | 26 | 17 | 8 | 0 | 0 | 0 |
| NOV 27 | (2.15) | 80 | 68 | 67 | 63 | 48 | 42 | 28 | 24 | 11 | 0 | 0 | 0 |
| DEC 4 | 1.28 | 64 | 35 | 26 | 15 | 12 | 11 | 9 | 9 | 9 | 4 | 0 | 0 |
| DEC 11 | ( .45) | 27 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 18 | (2.18) | 68 | 45 | 41 | 36 | 33 | 27 | 25 | 18 | 12 | 0 | 0 | 0 |
| DEC 25 | (1.03) | 71 | 35 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: WEST YELLOWSTONE, MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 2 | | | | | | | | | | | | | |
| JAN 9 | | | | | | | | | | | | | |
| JAN 16 | | | | | | | | | | | | | |
| JAN 23 | 4.98 | 98 | 95 | 86 | 78 | 73 | 66 | 60 | 54 | 40 | 22 | 3 | 0 |
| JAN 30 | 5.97 | 98 | 96 | 92 | 90 | 86 | 80 | 73 | 61 | 52 | 36 | 6 | 0 |
| FEB 6 | 5.65 | 96 | 85 | 79 | 77 | 73 | 67 | 61 | 51 | 44 | 28 | 9 | 0 |
| FEB 13 | 5.15 | 96 | 90 | 86 | 81 | 74 | 65 | 61 | 44 | 32 | 18 | 0 | 0 |
| FEB 20 | 4.56 | 97 | 92 | 82 | 73 | 61 | 50 | 37 | 29 | 19 | 13 | 0 | 0 |
| FEB 27 | 3.88 | 95 | 81 | 63 | 57 | 49 | 40 | 34 | 29 | 20 | 14 | 1 | 0 |
| MAR 6 | 3.83 | 94 | 82 | 66 | 50 | 42 | 32 | 24 | 19 | 12 | 8 | 2 | 0 |
| MAR 13 | 3.54 | 96 | 90 | 77 | 54 | 33 | 25 | 14 | 8 | 5 | 2 | 0 | 0 |
| MAR 20 | 4.51 | 96 | 83 | 69 | 58 | 50 | 44 | 34 | 29 | 20 | 9 | 0 | 0 |
| MAR 27 | 3.71 | 93 | 84 | 72 | 62 | 40 | 26 | 17 | 8 | 2 | 0 | 0 | 0 |
| APR 3 | (5.63) | 97 | 91 | 83 | 76 | 70 | 68 | 60 | 48 | 34 | 7 | 0 | 0 |
| APR 10 | 5.11 | 85 | 80 | 75 | 73 | 66 | 58 | 43 | 33 | 21 | 5 | 0 | 0 |
| APR 17 | 4.99 | 85 | 79 | 74 | 67 | 60 | 54 | 46 | 37 | 20 | 3 | 0 | 0 |
| APR 24 | 5.14 | 96 | 90 | 84 | 75 | 68 | 59 | 48 | 35 | 15 | 0 | 0 | 0 |
| MAY 1 | 3.34 | 91 | 78 | 67 | 55 | 44 | 32 | 14 | 5 | 2 | 0 | 0 | 0 |
| MAY 8 | 4.07 | 92 | 83 | 71 | 61 | 49 | 37 | 22 | 15 | 7 | 0 | 0 | 0 |
| MAY 15 | 3.34 | 90 | 75 | 61 | 48 | 32 | 23 | 16 | 12 | 5 | 0 | 0 | 0 |
| MAY 22 | (2.75) | 88 | 70 | 50 | 35 | 26 | 11 | 7 | 3 | 0 | 0 | 0 | 0 |
| MAY 29 | 4.70 | 95 | 89 | 81 | 69 | 57 | 45 | 29 | 10 | 0 | 0 | 0 | 0 |
| JUN 5 | 3.77 | 90 | 81 | 67 | 62 | 56 | 42 | 34 | 11 | 0 | 0 | 0 | 0 |
| JUN 12 | 4.94 | 95 | 90 | 83 | 77 | 70 | 56 | 43 | 23 | 5 | 0 | 0 | 0 |
| JUN 19 | 4.66 | 94 | 87 | 77 | 67 | 57 | 45 | 34 | 12 | 2 | 0 | 0 | 0 |
| JUN 26 | 4.73 | 94 | 86 | 77 | 69 | 60 | 48 | 35 | 9 | 0 | 0 | 0 | 0 |
| JUL 3 | 4.42 | 94 | 87 | 76 | 64 | 46 | 34 | 24 | 14 | 1 | 0 | 0 | 0 |
| JUL 10 | 5.44 | 96 | 90 | 85 | 79 | 73 | 63 | 51 | 34 | 1 | 0 | 0 | 0 |
| JUL 17 | | | | | | | | | | | | | |
| JUL 24 | | | | | | | | | | | | | |
| JUL 31 | | | | | | | | | | | | | |
| AUG 7 | | | | | | | | | | | | | |
| AUG 14 | | | | | | | | | | | | | |
| AUG 21 | (5.19) | 96 | 93 | 82 | 75 | 75 | 65 | 52 | 52 | 28 | 10 | 0 | 0 |
| AUG 28 | 4.24 | 94 | 86 | 66 | 57 | 46 | 37 | 30 | 23 | 14 | 1 | 0 | 0 |
| SEP 4 | (6.61) | 98 | 95 | 93 | 89 | 82 | 76 | 64 | 51 | 34 | 0 | 0 | 0 |
| SEP 11 | 4.40 | 91 | 78 | 69 | 61 | 58 | 49 | 43 | 36 | 19 | 0 | 0 | 0 |
| SEP 18 | 3.46 | 84 | 75 | 65 | 49 | 38 | 33 | 31 | 23 | 17 | 8 | 0 | 0 |
| SEP 25 | 3.92 | 91 | 82 | 72 | 58 | 48 | 41 | 34 | 27 | 22 | 11 | 2 | 0 |
| OCT 2 | (5.23) | 97 | 93 | 80 | 76 | 64 | 60 | 54 | 40 | 26 | 8 | 0 | 0 |
| OCT 9 | (5.98) | 98 | 95 | 90 | 85 | 77 | 69 | 56 | 44 | 34 | 9 | 0 | 0 |
| OCT 16 | 5.89 | 98 | 96 | 94 | 89 | 85 | 74 | 61 | 44 | 29 | 10 | 0 | 0 |
| OCT 23 | (5.02) | 96 | 94 | 91 | 84 | 84 | 78 | 65 | 57 | 39 | 20 | 0 | 0 |
| OCT 30 | (2.16) | 94 | 91 | 66 | 48 | 17 | 17 | 17 | 0 | 0 | 0 | 0 | 0 |
| NOV 6 | (4.23) | 98 | 96 | 77 | 63 | 57 | 47 | 38 | 28 | 9 | 4 | 0 | 0 |
| NOV 13 | 2.37 | 80 | 64 | 44 | 33 | 27 | 22 | 15 | 13 | 10 | 5 | 2 | 0 |
| NOV 20 | (2.21) | 77 | 56 | 44 | 38 | 37 | 36 | 27 | 19 | 12 | 9 | 0 | 0 |
| NOV 27 | 1.96 | 68 | 51 | 39 | 36 | 31 | 20 | 17 | 7 | 3 | 2 | 0 | 0 |
| DEC 4 | (2.02) | 76 | 68 | 57 | 54 | 41 | 26 | 20 | 15 | 7 | 0 | 0 | 0 |
| DEC 11 | 1.03 | 53 | 36 | 23 | 19 | 13 | 7 | 5 | 3 | 0 | 0 | 0 | 0 |
| DEC 18 | (3.54) | 86 | 74 | 71 | 69 | 61 | 59 | 55 | 55 | 44 | 24 | 3 | 0 |
| DEC 25 | (2.75) | 91 | 62 | 48 | 46 | 45 | 41 | 35 | 27 | 26 | 13 | 0 | 0 |

SOLAR RADIATION DATA for: BILLINGS,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (4.38) | 86 | 80 | 76 | 71 | 65 | 60 | 51 | 41 | 27 | 7 | 0 | 0 |
| MAR | (4.14) | 91 | 80 | 72 | 65 | 57 | 48 | 38 | 30 | 17 | 4 | 1 | 0 |
| APR | (5.20) | 94 | 87 | 81 | 73 | 65 | 58 | 48 | 35 | 16 | 1 | 0 | 0 |
| MAY | 4.23 | 91 | 82 | 72 | 63 | 53 | 42 | 30 | 14 | 1 | 0 | 0 | 0 |
| JUN | (4.76) | 94 | 88 | 82 | 75 | 66 | 54 | 41 | 24 | 2 | 0 | 0 | 0 |
| JUL | 4.66 | 94 | 88 | 80 | 72 | 62 | 52 | 40 | 21 | 0 | 0 | 0 | 0 |
| AUG | 4.77 | 94 | 86 | 80 | 73 | 66 | 55 | 43 | 30 | 5 | 0 | 0 | 0 |
| SEP | (5.25) | 93 | 87 | 80 | 76 | 70 | 63 | 53 | 40 | 23 | 4 | 0 | 0 |
| OCT | (4.46) | 90 | 83 | 76 | 70 | 64 | 56 | 47 | 33 | 17 | 1 | 0 | 0 |
| NOV | (3.73) | 90 | 85 | 78 | 69 | 59 | 51 | 39 | 28 | 13 | 1 | 0 | 0 |
| DEC | (3.13) | 83 | 69 | 62 | 59 | 53 | 46 | 36 | 27 | 15 | 2 | 0 | 0 |

SOLAR RADIATION DATA for: BROWNING,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | | | | | | | | | | | | | |
| MAR | | | | | | | | | | | | | |
| APR | (5.77) | 97 | 91 | 84 | 78 | 70 | 63 | 54 | 41 | 25 | 8 | 0 | 0 |
| MAY | (4.40) | 93 | 82 | 71 | 60 | 47 | 38 | 28 | 19 | 8 | 2 | 1 | 0 |
| JUN | (4.51) | 92 | 83 | 71 | 63 | 53 | 44 | 31 | 19 | 2 | 0 | 0 | 0 |
| JUL | 4.75 | 90 | 83 | 74 | 66 | 56 | 48 | 39 | 24 | 8 | 0 | 0 | 0 |
| AUG | (3.91) | 85 | 66 | 53 | 50 | 43 | 39 | 33 | 24 | 6 | 0 | 0 | 0 |
| SEP | (4.11) | 79 | 68 | 62 | 57 | 53 | 47 | 38 | 29 | 19 | 1 | 0 | 0 |
| OCT | (4.15) | 93 | 84 | 74 | 67 | 61 | 52 | 43 | 30 | 14 | 0 | 0 | 0 |
| NOV | (3.04) | 90 | 76 | 64 | 53 | 46 | 40 | 32 | 22 | 11 | 0 | 0 | 0 |
| DEC | (1.99) | 69 | 46 | 40 | 38 | 34 | 28 | 19 | 13 | 3 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: BOZEMAN,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (3.04) | 84 | 67 | 60 | 52 | 42 | 36 | 30 | 23 | 17 | 7 | 0 | 0 |
| FEB | 3.75 | 91 | 81 | 69 | 59 | 52 | 42 | 35 | 27 | 13 | 2 | 0 | 0 |
| MAR | (4.30) | 94 | 85 | 73 | 60 | 54 | 43 | 38 | 33 | 25 | 16 | 5 | 0 |
| APR | 5.49 | 96 | 91 | 84 | 75 | 69 | 60 | 52 | 41 | 24 | 3 | 1 | 0 |
| MAY | (3.85) | 89 | 76 | 65 | 56 | 43 | 35 | 26 | 18 | 4 | 0 | 0 | 0 |
| JUN | 4.63 | 92 | 85 | 77 | 69 | 61 | 49 | 34 | 14 | 1 | 0 | 0 | 0 |
| JUL | 4.80 | 94 | 87 | 78 | 69 | 60 | 48 | 37 | 23 | 3 | 0 | 0 | 0 |
| AUG | (4.78) | 94 | 85 | 78 | 71 | 66 | 57 | 46 | 28 | 3 | 1 | 0 | 0 |
| SEP | (4.73) | 91 | 81 | 72 | 67 | 60 | 54 | 44 | 37 | 22 | 1 | 0 | 0 |
| OCT | (4.41) | 89 | 80 | 72 | 66 | 60 | 51 | 43 | 36 | 22 | 5 | 1 | 0 |
| NOV | (1.99) | 73 | 58 | 48 | 38 | 30 | 20 | 16 | 12 | 7 | 2 | 1 | 0 |
| DEC | (1.93) | 67 | 53 | 39 | 33 | 29 | 23 | 19 | 16 | 12 | 4 | 1 | 0 |

SOLAR RADIATION DATA for: BUTTE,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (4.57) | 98 | 95 | 88 | 83 | 69 | 53 | 40 | 24 | 15 | 1 | 0 | 0 |
| FEB | 3.87 | 94 | 82 | 74 | 64 | 55 | 48 | 40 | 30 | 16 | 3 | 0 | 0 |
| MAR | (3.85) | 91 | 75 | 65 | 56 | 47 | 38 | 32 | 26 | 17 | 10 | 1 | 0 |
| APR | 5.41 | 97 | 91 | 84 | 74 | 66 | 59 | 50 | 41 | 25 | 2 | 0 | 0 |
| MAY | (3.41) | 89 | 70 | 57 | 43 | 31 | 24 | 18 | 13 | 4 | 0 | 0 | 0 |
| JUN | (4.30) | 91 | 84 | 76 | 64 | 55 | 43 | 31 | 11 | 1 | 0 | 0 | 0 |
| JUL | | | | | | | | | | | | | |
| AUG | | | | | | | | | | | | | |
| SEP | (3.77) | 90 | 75 | 66 | 53 | 48 | 39 | 33 | 24 | 14 | 4 | 0 | 0 |
| OCT | 4.47 | 95 | 87 | 80 | 71 | 63 | 53 | 44 | 32 | 20 | 3 | 1 | 0 |
| NOV | (3.76) | 96 | 88 | 80 | 70 | 62 | 50 | 39 | 28 | 16 | 4 | 0 | 0 |
| DEC | 2.08 | 70 | 46 | 40 | 37 | 34 | 29 | 24 | 17 | 11 | 1 | 0 | 0 |

SOLAR RADIATION DATA for: COLSTRIP,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (4.31) | 91 | 81 | 74 | 66 | 60 | 53 | 46 | 40 | 27 | 11 | 0 | 0 |
| MAR | 4.68 | 92 | 81 | 75 | 67 | 61 | 53 | 42 | 32 | 24 | 11 | 1 | 0 |
| APR | (5.52) | 96 | 90 | 84 | 77 | 69 | 61 | 51 | 38 | 22 | 1 | 0 | 0 |
| MAY | (4.70) | 91 | 80 | 73 | 66 | 58 | 51 | 38 | 24 | 6 | 1 | 0 | 0 |
| JUN | (5.17) | 94 | 90 | 86 | 79 | 68 | 51 | 36 | 9 | 0 | 0 | 0 | 0 |
| JUL | | | | | | | | | | | | | |
| AUG | | | | | | | | | | | | | |
| SEP | | | | | | | | | | | | | |
| OCT | | | | | | | | | | | | | |
| NOV | | | | | | | | | | | | | |
| DEC | | | | | | | | | | | | | |

SOLAR RADIATION DATA for: DILLON,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (4.48) | 97 | 90 | 84 | 74 | 70 | 64 | 55 | 40 | 25 | 9 | 0 | 0 |
| FEB | (4.25) | 95 | 86 | 78 | 71 | 62 | 51 | 43 | 32 | 21 | 10 | 1 | 0 |
| MAR | (3.94) | 91 | 79 | 69 | 59 | 50 | 42 | 33 | 24 | 15 | 6 | 1 | 0 |
| APR | (5.41) | 97 | 91 | 85 | 76 | 69 | 60 | 52 | 43 | 22 | 5 | 1 | 0 |
| MAY | (4.07) | 93 | 82 | 71 | 56 | 46 | 35 | 25 | 14 | 3 | 1 | 0 | 0 |
| JUN | 4.57 | 92 | 81 | 72 | 63 | 58 | 50 | 38 | 21 | 2 | 0 | 0 | 0 |
| JUL | (5.01) | 91 | 84 | 79 | 72 | 64 | 56 | 46 | 32 | 4 | 0 | 0 | 0 |
| AUG | (4.17) | 86 | 72 | 67 | 62 | 57 | 47 | 39 | 28 | 7 | 2 | 0 | 0 |
| SEP | 4.91 | 94 | 86 | 80 | 73 | 64 | 57 | 49 | 38 | 24 | 2 | 0 | 0 |
| OCT | (4.87) | 95 | 88 | 81 | 75 | 67 | 57 | 45 | 33 | 21 | 7 | 0 | 0 |
| NOV | 3.06 | 91 | 74 | 62 | 54 | 46 | 38 | 30 | 22 | 13 | 3 | 0 | 0 |
| DEC | (2.04) | 73 | 57 | 50 | 42 | 34 | 27 | 17 | 8 | 2 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: GLASGOW,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (3.43) | 93 | 77 | 69 | 62 | 56 | 46 | 35 | 22 | 11 | 0 | 0 | 0 |
| FEB | 3.94 | 90 | 81 | 73 | 65 | 59 | 49 | 39 | 28 | 14 | 1 | 0 | 0 |
| MAR | 4.48 | 90 | 82 | 73 | 65 | 54 | 47 | 38 | 29 | 18 | 2 | 0 | 0 |
| APR | 5.51 | 96 | 90 | 84 | 76 | 68 | 58 | 49 | 36 | 15 | 1 | 0 | 0 |
| MAY | (4.62) | 87 | 77 | 70 | 64 | 57 | 48 | 35 | 22 | 3 | 0 | 0 | 0 |
| JUN | 4.54 | 93 | 84 | 75 | 66 | 58 | 45 | 31 | 12 | 1 | 0 | 0 | 0 |
| JUL | (4.87) | 94 | 88 | 80 | 71 | 63 | 51 | 40 | 20 | 1 | 0 | 0 | 0 |
| AUG | 4.24 | 93 | 80 | 69 | 57 | 46 | 37 | 29 | 20 | 7 | 0 | 0 | 0 |
| SEP | 3.58 | 84 | 68 | 60 | 50 | 43 | 35 | 25 | 19 | 10 | 1 | 0 | 0 |
| OCT | 4.27 | 91 | 84 | 78 | 71 | 61 | 52 | 41 | 30 | 15 | 1 | 0 | 0 |
| NOV | (3.19) | 88 | 77 | 67 | 56 | 49 | 40 | 32 | 20 | 5 | 0 | 0 | 0 |
| DEC | 2.08 | 81 | 55 | 45 | 38 | 32 | 26 | 21 | 11 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: GLENDIVE,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (3.28) | 82 | 70 | 59 | 54 | 46 | 40 | 38 | 33 | 25 | 18 | 0 | 0 |
| FEB | 4.00 | 93 | 81 | 72 | 65 | 58 | 52 | 44 | 34 | 23 | 4 | 0 | 0 |
| MAR | 4.27 | 89 | 78 | 70 | 63 | 56 | 46 | 35 | 24 | 13 | 2 | 0 | 0 |
| APR | 5.31 | 96 | 90 | 82 | 72 | 64 | 57 | 49 | 38 | 18 | 1 | 0 | 0 |
| MAY | (4.87) | 93 | 85 | 78 | 71 | 62 | 53 | 41 | 29 | 2 | 0 | 0 | 0 |
| JUN | 4.73 | 95 | 87 | 80 | 70 | 59 | 48 | 31 | 13 | 0 | 0 | 0 | 0 |
| JUL | | | | | | | | | | | | | |
| AUG | (4.21) | 90 | 78 | 69 | 60 | 49 | 42 | 33 | 24 | 8 | 0 | 0 | 0 |
| SEP | 3.84 | 82 | 69 | 61 | 56 | 48 | 42 | 34 | 28 | 14 | 1 | 0 | 0 |
| OCT | 4.13 | 90 | 77 | 70 | 64 | 57 | 51 | 43 | 33 | 17 | 1 | 0 | 0 |
| NOV | (3.03) | 91 | 78 | 69 | 62 | 50 | 41 | 31 | 22 | 8 | 0 | 0 | 0 |
| DEC | (2.19) | 81 | 56 | 48 | 42 | 34 | 29 | 23 | 15 | 5 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: GREAT FALLS,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (1.51) | 74 | 49 | 34 | 29 | 18 | 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| FEB | 4.01 | 92 | 86 | 76 | 64 | 56 | 47 | 41 | 30 | 17 | 2 | 0 | 0 |
| MAR | 4.18 | 93 | 80 | 73 | 67 | 57 | 48 | 37 | 26 | 16 | 4 | 0 | 0 |
| APR | 5.23 | 97 | 89 | 82 | 74 | 66 | 57 | 44 | 28 | 14 | 1 | 0 | 0 |
| MAY | 4.34 | 91 | 78 | 67 | 58 | 49 | 37 | 31 | 20 | 4 | 1 | 0 | 0 |
| JUN | 4.86 | 94 | 86 | 79 | 70 | 61 | 50 | 37 | 19 | 1 | 0 | 0 | 0 |
| JUL | 5.09 | 95 | 89 | 80 | 72 | 63 | 53 | 40 | 24 | 4 | 0 | 0 | 0 |
| AUG | 4.42 | 91 | 79 | 67 | 60 | 52 | 46 | 36 | 26 | 11 | 1 | 0 | 0 |
| SEP | 4.41 | 88 | 77 | 69 | 63 | 57 | 50 | 42 | 33 | 22 | 2 | 0 | 0 |
| OCT | 4.06 | 88 | 79 | 72 | 65 | 60 | 52 | 45 | 33 | 19 | 3 | 0 | 0 |
| NOV | (3.24) | 92 | 78 | 70 | 62 | 52 | 44 | 33 | 22 | 10 | 1 | 0 | 0 |
| DEC | (3.02) | 87 | 76 | 67 | 61 | 53 | 46 | 37 | 26 | 5 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HAMILTON,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | | | | | | | | | | | | | |
| MAR | (3.54) | 92 | 77 | 66 | 56 | 44 | 33 | 27 | 19 | 14 | 8 | 1 | 0 |
| APR | (5.24) | 96 | 85 | 79 | 73 | 64 | 55 | 46 | 35 | 24 | 8 | 1 | 0 |
| MAY | (3.81) | 92 | 76 | 60 | 48 | 37 | 29 | 23 | 15 | 8 | 1 | 0 | 0 |
| JUN | (4.52) | 93 | 82 | 72 | 63 | 53 | 44 | 32 | 14 | 0 | 0 | 0 | 0 |
| JUL | (4.16) | 93 | 82 | 73 | 62 | 49 | 41 | 29 | 12 | 1 | 0 | 0 | 0 |
| AUG | | | | | | | | | | | | | |
| SEP | (3.17) | 89 | 69 | 57 | 47 | 35 | 28 | 21 | 15 | 7 | 3 | 0 | 0 |
| OCT | 4.13 | 92 | 80 | 72 | 64 | 58 | 50 | 37 | 27 | 17 | 3 | 0 | 0 |
| NOV | (2.45) | 83 | 62 | 53 | 47 | 39 | 34 | 29 | 18 | 12 | 1 | 0 | 0 |
| DEC | (1.53) | 65 | 44 | 30 | 26 | 22 | 19 | 15 | 10 | 1 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HARLOWTON,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Foulkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (3.22) | 95 | 90 | 84 | 71 | 54 | 49 | 49 | 23 | 13 | 0 | 0 | 0 |
| FEB | (4.60) | 95 | 87 | 79 | 68 | 59 | 53 | 45 | 38 | 27 | 12 | 0 | 0 |
| MAR | 4.60 | 95 | 85 | 77 | 71 | 61 | 53 | 46 | 33 | 22 | 9 | 0 | 0 |
| APR | 5.58 | 96 | 87 | 81 | 74 | 68 | 63 | 53 | 40 | 26 | 6 | 0 | 0 |
| MAY | (4.28) | 90 | 78 | 68 | 59 | 50 | 40 | 31 | 23 | 10 | 0 | 0 | 0 |
| JUN | (5.30) | 95 | 90 | 85 | 81 | 74 | 61 | 45 | 24 | 0 | 0 | 0 | 0 |
| JUL | (4.75) | 94 | 86 | 76 | 68 | 60 | 52 | 42 | 26 | 7 | 0 | 0 | 0 |
| AUG | 4.72 | 92 | 83 | 75 | 67 | 59 | 50 | 41 | 31 | 16 | 1 | 0 | 0 |
| SEP | 4.85 | 93 | 84 | 78 | 73 | 64 | 55 | 44 | 36 | 22 | 7 | 1 | 0 |
| OCT | (4.46) | 88 | 80 | 73 | 67 | 61 | 53 | 46 | 34 | 19 | 2 | 0 | 0 |
| NOV | (2.57) | 87 | 64 | 50 | 41 | 34 | 28 | 21 | 12 | 6 | 0 | 0 | 0 |
| DEC | 2.79 | 80 | 63 | 56 | 50 | 44 | 39 | 30 | 22 | 14 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HAVRE,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Foulkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (4.17) | 94 | 85 | 77 | 67 | 60 | 54 | 45 | 37 | 21 | 8 | 0 | 0 |
| MAR | (4.60) | 94 | 85 | 74 | 66 | 58 | 53 | 45 | 34 | 22 | 10 | 1 | 0 |
| APR | (5.49) | 96 | 91 | 84 | 78 | 70 | 62 | 50 | 35 | 16 | 2 | 0 | 0 |
| MAY | (4.57) | 89 | 81 | 75 | 68 | 59 | 50 | 36 | 24 | 7 | 1 | 0 | 0 |
| JUN | (4.68) | 92 | 82 | 75 | 68 | 60 | 49 | 36 | 20 | 1 | 0 | 0 | 0 |
| JUL | 4.66 | 91 | 83 | 76 | 68 | 60 | 49 | 37 | 21 | 2 | 0 | 0 | 0 |
| AUG | (4.42) | 90 | 77 | 67 | 62 | 52 | 45 | 37 | 26 | 7 | 0 | 0 | 0 |
| SEP | 4.05 | 81 | 71 | 65 | 58 | 52 | 47 | 39 | 31 | 22 | 4 | 1 | 0 |
| OCT | 4.38 | 92 | 87 | 79 | 71 | 62 | 51 | 41 | 33 | 19 | 1 | 0 | 0 |
| NOV | (3.25) | 85 | 69 | 63 | 58 | 51 | 44 | 38 | 30 | 15 | 0 | 0 | 0 |
| DEC | (2.38) | 81 | 66 | 57 | 51 | 44 | 34 | 24 | 14 | 3 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HELENA,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (2.39) | 87 | 64 | 54 | 43 | 36 | 26 | 21 | 13 | 7 | 2 | 0 | 0 |
| FEB | (4.17) | 91 | 83 | 76 | 67 | 58 | 50 | 42 | 32 | 18 | 7 | 0 | 0 |
| MAR | (3.81) | 93 | 78 | 64 | 53 | 46 | 37 | 29 | 22 | 13 | 5 | 0 | 0 |
| APR | (5.11) | 96 | 90 | 83 | 74 | 66 | 56 | 46 | 31 | 14 | 0 | 0 | 0 |
| MAY | (4.07) | 92 | 76 | 68 | 57 | 49 | 35 | 26 | 19 | 6 | 1 | 0 | 0 |
| JUN | (4.65) | 91 | 78 | 72 | 65 | 58 | 49 | 37 | 22 | 2 | 0 | 0 | 0 |
| JUL | (5.07) | 94 | 88 | 83 | 73 | 65 | 55 | 41 | 26 | 2 | 0 | 0 | 0 |
| AUG | (4.74) | 92 | 84 | 75 | 66 | 59 | 49 | 42 | 31 | 8 | 0 | 0 | 0 |
| SEP | 4.54 | 92 | 81 | 72 | 64 | 57 | 50 | 41 | 31 | 16 | 4 | 0 | 0 |
| OCT | 4.45 | 95 | 88 | 79 | 72 | 64 | 55 | 44 | 29 | 14 | 2 | 0 | 0 |
| NOV | (3.11) | 84 | 71 | 62 | 56 | 50 | 42 | 36 | 27 | 14 | 2 | 0 | 0 |
| DEC | (2.29) | 80 | 61 | 53 | 44 | 34 | 27 | 22 | 18 | 12 | 2 | 0 | 0 |

SOLAR RADIATION DATA for: KALISPELL,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (2.80) | 84 | 63 | 51 | 42 | 35 | 27 | 22 | 17 | 10 | 0 | 0 | 0 |
| MAR | (2.99) | 85 | 65 | 53 | 43 | 33 | 28 | 21 | 15 | 9 | 2 | 0 | 0 |
| APR | 5.01 | 95 | 87 | 77 | 70 | 61 | 50 | 40 | 32 | 20 | 0 | 0 | 0 |
| MAY | 3.89 | 91 | 76 | 65 | 55 | 42 | 34 | 23 | 15 | 5 | 0 | 0 | 0 |
| JUN | (4.73) | 93 | 81 | 72 | 63 | 54 | 46 | 33 | 17 | 1 | 0 | 0 | 0 |
| JUL | (4.04) | 87 | 75 | 62 | 51 | 41 | 33 | 23 | 11 | 3 | 0 | 0 | 0 |
| AUG | 4.75 | 90 | 80 | 73 | 68 | 60 | 54 | 45 | 33 | 13 | 1 | 0 | 0 |
| SEP | (3.66) | 83 | 72 | 63 | 54 | 46 | 38 | 31 | 22 | 12 | 1 | 0 | 0 |
| OCT | (3.87) | 91 | 78 | 71 | 63 | 58 | 49 | 38 | 28 | 12 | 0 | 0 | 0 |
| NOV | (2.49) | 74 | 55 | 52 | 48 | 43 | 35 | 28 | 19 | 9 | 1 | 0 | 0 |
| DEC | (1.82) | 63 | 46 | 34 | 31 | 25 | 18 | 15 | 11 | 6 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: LEWISTOWN, MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (4.16) | 93 | 73 | 66 | 60 | 53 | 49 | 43 | 36 | 24 | 8 | 0 | 0 |
| MAR | 4.47 | 96 | 87 | 76 | 63 | 56 | 48 | 39 | 31 | 19 | 7 | 0 | 0 |
| APR | (5.44) | 96 | 89 | 82 | 75 | 67 | 57 | 49 | 38 | 20 | 3 | 0 | 0 |
| MAY | 4.42 | 90 | 77 | 69 | 61 | 51 | 43 | 35 | 25 | 6 | 0 | 0 | 0 |
| JUN | 5.07 | 95 | 88 | 81 | 71 | 62 | 52 | 40 | 23 | 3 | 0 | 0 | 0 |
| JUL | (4.73) | 93 | 85 | 76 | 70 | 60 | 49 | 40 | 27 | 5 | 0 | 0 | 0 |
| AUG | 4.25 | 89 | 80 | 72 | 62 | 51 | 41 | 35 | 26 | 9 | 0 | 0 | 0 |
| SEP | (4.70) | 91 | 80 | 73 | 66 | 59 | 51 | 44 | 33 | 18 | 3 | 0 | 0 |
| OCT | 4.38 | 94 | 84 | 78 | 68 | 62 | 54 | 44 | 32 | 14 | 1 | 0 | 0 |
| NOV | (2.97) | 89 | 70 | 63 | 53 | 46 | 38 | 26 | 18 | 6 | 0 | 0 | 0 |
| DEC | (2.85) | 90 | 68 | 59 | 53 | 46 | 38 | 31 | 20 | 8 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: LIBBY, MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (3.27) | 92 | 77 | 70 | 64 | 54 | 48 | 42 | 30 | 18 | 5 | 1 | 0 |
| MAR | (3.42) | 90 | 79 | 69 | 55 | 44 | 35 | 23 | 15 | 9 | 2 | 0 | 0 |
| APR | (5.26) | 96 | 90 | 79 | 73 | 65 | 56 | 46 | 35 | 19 | 2 | 0 | 0 |
| MAY | (3.51) | 90 | 71 | 56 | 45 | 36 | 26 | 18 | 11 | 5 | 0 | 0 | 0 |
| JUN | (4.76) | 94 | 85 | 77 | 68 | 57 | 46 | 32 | 23 | 3 | 0 | 0 | 0 |
| JUL | (4.43) | 91 | 80 | 71 | 59 | 49 | 40 | 32 | 23 | 8 | 0 | 0 | 0 |
| AUG | (5.62) | 95 | 88 | 82 | 78 | 71 | 63 | 52 | 40 | 17 | 0 | 0 | 0 |
| SEP | (3.69) | 87 | 73 | 64 | 54 | 45 | 36 | 30 | 24 | 15 | 2 | 0 | 0 |
| OCT | (3.58) | 92 | 81 | 72 | 64 | 58 | 49 | 40 | 32 | 14 | 0 | 0 | 0 |
| NOV | (2.17) | 81 | 63 | 51 | 43 | 37 | 31 | 20 | 13 | 3 | 0 | 0 | 0 |
| DEC | (4.05) | 97 | 96 | 92 | 92 | 87 | 81 | 72 | 54 | 22 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: MILES CITY,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (3.54) | 92 | 74 | 67 | 63 | 53 | 47 | 37 | 26 | 16 | 5 | 1 | 0 |
| FEB | 4.26 | 91 | 82 | 75 | 69 | 63 | 54 | 46 | 36 | 25 | 4 | 0 | 0 |
| MAR | 4.49 | 91 | 83 | 74 | 64 | 57 | 48 | 39 | 29 | 19 | 4 | 0 | 0 |
| APR | 5.65 | 96 | 90 | 85 | 81 | 74 | 63 | 53 | 39 | 17 | 0 | 0 | 0 |
| MAY | 4.54 | 89 | 81 | 73 | 65 | 57 | 48 | 36 | 17 | 3 | 0 | 0 | 0 |
| JUN | (5.10) | 95 | 91 | 84 | 76 | 64 | 53 | 38 | 22 | 1 | 0 | 0 | 0 |
| JUL | (4.96) | 92 | 86 | 79 | 69 | 60 | 51 | 41 | 20 | 0 | 0 | 0 | 0 |
| AUG | (4.54) | 92 | 83 | 75 | 67 | 59 | 48 | 38 | 25 | 7 | 0 | 0 | 0 |
| SEP | 4.46 | 86 | 77 | 71 | 62 | 55 | 47 | 40 | 30 | 18 | 2 | 0 | 0 |
| OCT | 4.53 | 86 | 81 | 77 | 71 | 66 | 57 | 49 | 39 | 19 | 1 | 0 | 0 |
| NOV | 3.13 | 88 | 72 | 64 | 55 | 47 | 38 | 32 | 23 | 11 | 0 | 0 | 0 |
| DEC | (2.29) | 77 | 56 | 49 | 42 | 35 | 30 | 24 | 16 | 3 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: MISSOULA,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (2.82) | 88 | 74 | 57 | 53 | 42 | 32 | 21 | 12 | 3 | 0 | 0 | 0 |
| FEB | 3.24 | 85 | 68 | 60 | 53 | 45 | 38 | 30 | 23 | 9 | 0 | 0 | 0 |
| MAR | 2.88 | 87 | 64 | 49 | 39 | 30 | 24 | 20 | 16 | 9 | 3 | 0 | 0 |
| APR | 5.14 | 96 | 87 | 80 | 73 | 65 | 57 | 44 | 33 | 20 | 5 | 0 | 0 |
| MAY | 3.59 | 89 | 72 | 57 | 49 | 39 | 29 | 21 | 13 | 6 | 1 | 0 | 0 |
| JUN | (4.66) | 94 | 84 | 77 | 66 | 54 | 44 | 30 | 18 | 2 | 0 | 0 | 0 |
| JUL | (4.14) | 91 | 79 | 68 | 60 | 51 | 40 | 27 | 13 | 2 | 0 | 0 | 0 |
| AUG | 4.66 | 92 | 81 | 72 | 66 | 60 | 53 | 42 | 32 | 11 | 2 | 0 | 0 |
| SEP | (3.63) | 90 | 73 | 64 | 52 | 46 | 40 | 34 | 29 | 16 | 3 | 0 | 0 |
| OCT | (4.13) | 93 | 81 | 73 | 66 | 58 | 49 | 39 | 30 | 17 | 3 | 0 | 0 |
| NOV | (2.25) | 83 | 68 | 58 | 50 | 40 | 33 | 24 | 13 | 4 | 2 | 0 | 0 |
| DEC | (1.47) | 68 | 43 | 30 | 29 | 20 | 17 | 13 | 9 | 4 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: POLSON,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (1.96) | 65 | 51 | 35 | 29 | 27 | 16 | 12 | 6 | 2 | 0 | 0 | 0 |
| FEB | (2.75) | 74 | 62 | 53 | 46 | 38 | 32 | 26 | 20 | 11 | 4 | 0 | 0 |
| MAR | 3.01 | 86 | 70 | 58 | 48 | 37 | 30 | 25 | 18 | 13 | 7 | 0 | 0 |
| APR | 5.19 | 94 | 88 | 78 | 72 | 61 | 52 | 43 | 33 | 17 | 2 | 0 | 0 |
| MAY | 4.00 | 92 | 78 | 66 | 56 | 46 | 37 | 27 | 17 | 6 | 1 | 0 | 0 |
| JUN | 4.67 | 93 | 84 | 75 | 66 | 56 | 44 | 33 | 15 | 0 | 0 | 0 | 0 |
| JUL | 4.53 | 92 | 82 | 73 | 64 | 54 | 45 | 34 | 23 | 3 | 0 | 0 | 0 |
| AUG | 4.95 | 92 | 86 | 77 | 69 | 62 | 56 | 47 | 35 | 12 | 0 | 0 | 0 |
| SEP | 3.97 | 87 | 77 | 68 | 63 | 52 | 43 | 33 | 24 | 16 | 2 | 0 | 0 |
| OCT | 4.07 | 88 | 80 | 73 | 65 | 58 | 48 | 41 | 31 | 20 | 5 | 0 | 0 |
| NOV | (2.30) | 78 | 63 | 57 | 52 | 42 | 36 | 27 | 21 | 12 | 3 | 0 | 0 |
| DEC | (1.59) | 65 | 41 | 31 | 24 | 22 | 20 | 18 | 14 | 10 | 2 | 0 | 0 |

SOLAR RADIATION DATA for: WEST YELLOWSTONE,MONTANA 1977

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (4.98) | 98 | 95 | 86 | 80 | 76 | 67 | 62 | 53 | 40 | 21 | 3 | 0 |
| FEB | 5.14 | 97 | 89 | 81 | 76 | 69 | 62 | 53 | 43 | 34 | 22 | 4 | 0 |
| MAR | 3.92 | 95 | 84 | 70 | 56 | 43 | 33 | 25 | 20 | 13 | 7 | 1 | 0 |
| APR | (5.17) | 91 | 85 | 80 | 73 | 66 | 59 | 48 | 36 | 20 | 3 | 0 | 0 |
| MAY | (3.54) | 91 | 78 | 65 | 52 | 40 | 28 | 17 | 9 | 3 | 0 | 0 | 0 |
| JUN | 4.60 | 94 | 87 | 78 | 70 | 61 | 48 | 37 | 14 | 2 | 0 | 0 | 0 |
| JUL | (4.76) | 95 | 87 | 77 | 69 | 58 | 46 | 34 | 21 | 1 | 0 | 0 | 0 |
| AUG | (3.27) | 93 | 83 | 55 | 42 | 32 | 22 | 15 | 13 | 6 | 2 | 0 | 0 |
| SEP | (4.77) | 92 | 84 | 77 | 67 | 60 | 53 | 46 | 37 | 24 | 5 | 1 | 0 |
| OCT | (5.34) | 97 | 93 | 86 | 79 | 70 | 63 | 53 | 39 | 27 | 9 | 0 | 0 |
| NOV | (2.55) | 80 | 65 | 50 | 42 | 38 | 31 | 23 | 16 | 10 | 6 | 1 | 0 |
| DEC | (2.09) | 72 | 55 | 44 | 41 | 34 | 28 | 24 | 20 | 15 | 7 | 1 | 0 |

# 1978 SOLAR DATA

alphabetically by station

Weekly Averages, pages 43 - 72
Monthly Averages, pages 73 - 87

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | | | | | | | | | | | | | |
| FEB 19 | | | | | | | | | | | | | |
| FEB 26 | | | | | | | | | | | | | |
| MAR 5 | | | | | | | | | | | | | |
| MAR 12 | | | | | | | | | | | | | |
| MAR 19 | | | | | | | | | | | | | |
| MAR 26 | (4.76) | 97 | 92 | 87 | 79 | 74 | 63 | 56 | 49 | 21 | 2 | 0 | 0 |
| APR 2 | 3.70 | 89 | 78 | 68 | 60 | 46 | 36 | 30 | 18 | 11 | 5 | 0 | 0 |
| APR 9 | 4.86 | 95 | 89 | 83 | 74 | 65 | 56 | 44 | 33 | 17 | 0 | 0 | 0 |
| APR 16 | (4.45) | 91 | 83 | 70 | 60 | 49 | 44 | 35 | 24 | 13 | 3 | 0 | 0 |
| APR 23 | 3.12 | 88 | 69 | 57 | 37 | 25 | 19 | 15 | 9 | 3 | 0 | 0 | 0 |
| APR 30 | 2.12 | 78 | 43 | 23 | 14 | 14 | 10 | 6 | 3 | 0 | 0 | 0 | 0 |
| MAY 7 | 4.25 | 93 | 85 | 72 | 65 | 53 | 42 | 33 | 25 | 2 | 0 | 0 | 0 |
| MAY 14 | 3.08 | 75 | 57 | 41 | 35 | 29 | 26 | 22 | 15 | 4 | 2 | 0 | 0 |
| MAY 21 | 2.89 | 81 | 64 | 41 | 32 | 25 | 18 | 14 | 10 | 4 | 0 | 0 | 0 |
| MAY 28 | 4.47 | 92 | 80 | 69 | 59 | 52 | 39 | 32 | 20 | 7 | 0 | 0 | 0 |
| JUN 4 | 4.33 | 92 | 84 | 73 | 63 | 52 | 35 | 23 | 13 | 2 | 0 | 0 | 0 |
| JUN 11 | 4.01 | 91 | 78 | 67 | 61 | 45 | 36 | 25 | 11 | 4 | 0 | 0 | 0 |
| JUN 18 | (3.70) | 89 | 83 | 64 | 48 | 43 | 36 | 25 | 10 | 0 | 0 | 0 | 0 |
| JUN 25 | | | | | | | | | | | | | |
| JUL 2 | (3.54) | 89 | 76 | 60 | 49 | 38 | 35 | 28 | 15 | 6 | 0 | 0 | 0 |
| JUL 9 | 5.80 | 95 | 91 | 86 | 82 | 74 | 64 | 56 | 43 | 24 | 1 | 0 | 0 |
| JUL 16 | (4.05) | 90 | 79 | 74 | 64 | 51 | 43 | 32 | 18 | 6 | 2 | 0 | 0 |
| JUL 23 | 5.31 | 94 | 87 | 82 | 73 | 67 | 56 | 44 | 29 | 8 | 6 | 3 | 0 |
| JUL 30 | (3.93) | 99 | 98 | 96 | 41 | 37 | 31 | 24 | 22 | 10 | 0 | 0 | 0 |
| AUG 6 | | | | | | | | | | | | | |
| AUG 13 | | | | | | | | | | | | | |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | (4.59) | 96 | 91 | 81 | 71 | 62 | 54 | 48 | 31 | 16 | 0 | 0 | 0 |
| SEP 3 | 4.65 | 90 | 78 | 73 | 69 | 62 | 58 | 53 | 42 | 29 | 4 | 0 | 0 |
| SEP 10 | 2.67 | 75 | 51 | 43 | 39 | 30 | 20 | 10 | 7 | 7 | 3 | 0 | 0 |
| SEP 17 | 3.83 | 88 | 75 | 69 | 61 | 50 | 38 | 32 | 23 | 18 | 10 | 5 | 2 |
| SEP 24 | 5.41 | 94 | 90 | 87 | 80 | 74 | 65 | 60 | 46 | 31 | 13 | 0 | 0 |
| OCT 1 | 6.01 | 98 | 95 | 93 | 88 | 82 | 69 | 62 | 54 | 42 | 24 | 2 | 0 |
| OCT 8 | (6.32) | 98 | 96 | 94 | 92 | 90 | 83 | 75 | 64 | 49 | 23 | 0 | 0 |
| OCT 15 | 4.46 | 96 | 91 | 78 | 68 | 58 | 53 | 50 | 41 | 29 | 17 | 0 | 0 |
| OCT 22 | 4.82 | 98 | 95 | 90 | 86 | 80 | 69 | 55 | 40 | 20 | 6 | 0 | 0 |
| OCT 29 | 4.00 | 92 | 82 | 74 | 60 | 56 | 50 | 42 | 30 | 20 | 1 | 0 | 0 |
| NOV 5 | 1.66 | 71 | 51 | 28 | 26 | 21 | 16 | 7 | 4 | 4 | 0 | 0 | 0 |
| NOV 12 | (3.21) | 79 | 59 | 53 | 45 | 42 | 38 | 34 | 27 | 17 | 0 | 0 | 0 |
| NOV 19 | (2.13) | 89 | 72 | 58 | 47 | 39 | 26 | 16 | 9 | 0 | 0 | 0 | 0 |
| NOV 26 | 2.36 | 86 | 58 | 55 | 51 | 45 | 34 | 28 | 20 | 8 | 1 | 0 | 0 |
| DEC 3 | 1.66 | 67 | 45 | 38 | 34 | 22 | 15 | 12 | 3 | 0 | 0 | 0 | 0 |
| DEC 10 | (2.59) | 85 | 63 | 60 | 56 | 45 | 30 | 14 | 4 | 0 | 0 | 0 | 0 |
| DEC 17 | (1.45) | 87 | 52 | 40 | 24 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 24 | 2.35 | 90 | 79 | 64 | 50 | 42 | 34 | 18 | 13 | 3 | 0 | 0 | 0 |

# SOLAR RADIATION DATA for: BILLINGS,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Foulkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 2.95 | 89 | 74 | 57 | 54 | 47 | 38 | 29 | 25 | 14 | 0 | 0 | 0 |
| JAN 8 | 2.35 | 83 | 47 | 40 | 38 | 34 | 28 | 22 | 13 | 4 | 1 | 0 | 0 |
| JAN 15 | 3.39 | 94 | 78 | 66 | 59 | 48 | 41 | 36 | 30 | 16 | 2 | 0 | 0 |
| JAN 22 | 1.95 | 89 | 61 | 41 | 31 | 19 | 17 | 9 | 4 | 2 | 2 | 0 | 0 |
| JAN 29 | 3.59 | 92 | 81 | 59 | 52 | 45 | 43 | 40 | 35 | 27 | 16 | 0 | 0 |
| FEB 5 | 2.36 | 81 | 38 | 34 | 32 | 25 | 21 | 20 | 16 | 13 | 7 | 0 | 0 |
| FEB 12 | 4.19 | 94 | 77 | 67 | 63 | 55 | 51 | 46 | 37 | 22 | 10 | 1 | 0 |
| FEB 19 | 3.57 | 94 | 73 | 61 | 55 | 47 | 41 | 33 | 21 | 17 | 9 | 0 | 0 |
| FEB 26 | 5.39 | 97 | 93 | 83 | 77 | 70 | 64 | 52 | 42 | 33 | 18 | 0 | 0 |
| MAR 5 | 5.40 | 97 | 93 | 89 | 79 | 69 | 60 | 53 | 41 | 29 | 13 | 4 | 0 |
| MAR 12 | 4.56 | 96 | 90 | 71 | 64 | 58 | 46 | 35 | 26 | 17 | 6 | 0 | 0 |
| MAR 19 | 3.82 | 82 | 67 | 59 | 54 | 46 | 36 | 33 | 23 | 8 | 0 | 0 | 0 |
| MAR 26 | 5.25 | 96 | 91 | 86 | 80 | 72 | 60 | 51 | 39 | 28 | 5 | 0 | 0 |
| APR 2 | 4.85 | 97 | 92 | 86 | 78 | 66 | 52 | 37 | 24 | 8 | 1 | 0 | 0 |
| APR 9 | 4.33 | 87 | 79 | 72 | 66 | 58 | 47 | 35 | 25 | 9 | 0 | 0 | 0 |
| APR 16 | 3.64 | 86 | 59 | 51 | 46 | 41 | 34 | 33 | 22 | 12 | 4 | 0 | 0 |
| APR 23 | (2.73) | 74 | 59 | 41 | 36 | 32 | 27 | 27 | 19 | 11 | 2 | 0 | 0 |
| APR 30 | 2.77 | 83 | 56 | 40 | 32 | 27 | 19 | 15 | 10 | 6 | 2 | 0 | 0 |
| MAY 7 | 3.84 | 90 | 78 | 65 | 53 | 49 | 37 | 32 | 22 | 11 | 3 | 0 | 0 |
| MAY 14 | 3.23 | 67 | 52 | 47 | 43 | 40 | 33 | 28 | 18 | 4 | 0 | 0 | 0 |
| MAY 21 | 5.06 | 93 | 91 | 85 | 79 | 73 | 63 | 52 | 32 | 1 | 0 | 0 | 0 |
| MAY 28 | 3.43 | 76 | 65 | 57 | 50 | 44 | 39 | 25 | 16 | 0 | 0 | 0 | 0 |
| JUN 4 | 4.72 | 93 | 87 | 83 | 75 | 65 | 55 | 43 | 19 | 0 | 0 | 0 | 0 |
| JUN 11 | 4.61 | 93 | 89 | 79 | 70 | 61 | 51 | 39 | 21 | 4 | 0 | 0 | 0 |
| JUN 18 | 4.73 | 92 | 88 | 86 | 81 | 72 | 60 | 49 | 16 | 0 | 0 | 0 | 0 |
| JUN 25 | 4.59 | 93 | 88 | 84 | 79 | 73 | 60 | 45 | 9 | 0 | 0 | 0 | 0 |
| JUL 2 | 3.68 | 87 | 80 | 67 | 53 | 43 | 33 | 25 | 6 | 0 | 0 | 0 | 0 |
| JUL 9 | 4.41 | 94 | 86 | 80 | 68 | 60 | 51 | 38 | 12 | 0 | 0 | 0 | 0 |
| JUL 16 | 3.45 | 82 | 64 | 56 | 50 | 41 | 35 | 28 | 13 | 0 | 0 | 0 | 0 |
| JUL 23 | 4.78 | 92 | 85 | 76 | 72 | 63 | 56 | 43 | 22 | 0 | 0 | 0 | 0 |
| JUL 30 | 5.05 | 95 | 92 | 83 | 74 | 68 | 58 | 46 | 24 | 1 | 0 | 0 | 0 |
| AUG 6 | 5.42 | 96 | 94 | 90 | 83 | 75 | 65 | 56 | 33 | 2 | 0 | 0 | 0 |
| AUG 13 | 4.35 | 90 | 82 | 73 | 69 | 58 | 46 | 37 | 28 | 11 | 0 | 0 | 0 |
| AUG 20 | 5.58 | 97 | 94 | 89 | 85 | 79 | 70 | 62 | 48 | 15 | 0 | 0 | 0 |
| AUG 27 | 5.46 | 97 | 91 | 87 | 79 | 75 | 68 | 59 | 45 | 21 | 1 | 0 | 0 |
| SEP 3 | 5.09 | 96 | 90 | 85 | 80 | 73 | 60 | 50 | 35 | 19 | 0 | 0 | 0 |
| SEP 10 | (1.14) | 43 | 26 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SEP 17 | | | | | | | | | | | | | |
| SEP 24 | (5.13) | 96 | 94 | 89 | 80 | 68 | 63 | 52 | 36 | 20 | 6 | 0 | 0 |
| OCT 1 | (5.73) | 98 | 94 | 90 | 85 | 79 | 70 | 63 | 44 | 30 | 12 | 0 | 0 |
| OCT 8 | (4.93) | 96 | 93 | 85 | 80 | 74 | 68 | 60 | 47 | 30 | 0 | 0 | 0 |
| OCT 15 | (5.27) | 98 | 95 | 89 | 87 | 80 | 71 | 56 | 36 | 18 | 0 | 0 | 0 |
| OCT 22 | (4.35) | 97 | 95 | 88 | 83 | 78 | 69 | 62 | 37 | 23 | 0 | 0 | 0 |
| OCT 29 | 5.04 | 96 | 94 | 88 | 84 | 76 | 70 | 60 | 44 | 25 | 2 | 0 | 0 |
| NOV 5 | 2.80 | 80 | 75 | 61 | 50 | 39 | 30 | 21 | 15 | 12 | 0 | 0 | 0 |
| NOV 12 | 3.55 | 88 | 65 | 47 | 45 | 38 | 34 | 32 | 25 | 20 | 8 | 0 | 0 |
| NOV 19 | 3.91 | 96 | 80 | 71 | 66 | 61 | 49 | 46 | 35 | 21 | 0 | 0 | 0 |
| NOV 26 | 2.10 | 71 | 50 | 43 | 39 | 30 | 24 | 14 | 8 | 4 | 2 | 0 | 0 |
| DEC 3 | 3.26 | 83 | 78 | 71 | 66 | 58 | 52 | 37 | 23 | 10 | 0 | 0 | 0 |
| DEC 10 | 3.27 | 94 | 83 | 77 | 71 | 61 | 51 | 40 | 27 | 21 | 3 | 0 | 0 |
| DEC 17 | 1.80 | 86 | 71 | 51 | 51 | 39 | 30 | 20 | 12 | 10 | 0 | 0 | 0 |
| DEC 24 | 3.40 | 95 | 86 | 76 | 68 | 54 | 44 | 38 | 28 | 14 | 2 | 0 | 0 |

SOLAR RADIATION DATA for: BOZEMAN,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | 3.74 | 95 | 87 | 80 | 75 | 66 | 62 | 52 | 43 | 31 | 17 | 6 | 0 |
| JAN 8 | 1.07 | 60 | 34 | 23 | 14 | 10 | 7 | 5 | 0 | 0 | 0 | 0 | 0 |
| JAN 15 | 3.10 | 95 | 86 | 69 | 59 | 48 | 41 | 31 | 29 | 20 | 7 | 0 | 0 |
| JAN 22 | 2.06 | 85 | 50 | 33 | 27 | 24 | 20 | 18 | 9 | 3 | 0 | 0 | 0 |
| JAN 29 | 3.45 | 89 | 79 | 68 | 59 | 53 | 50 | 45 | 36 | 26 | 18 | 0 | 0 |
| FEB 5 | 2.70 | 91 | 69 | 51 | 39 | 33 | 24 | 19 | 16 | 11 | 8 | 3 | 2 |
| FEB 12 | (4.44) | 96 | 89 | 79 | 68 | 58 | 48 | 44 | 35 | 25 | 16 | 0 | 0 |
| FEB 19 | 4.04 | 96 | 85 | 67 | 57 | 55 | 51 | 43 | 37 | 28 | 18 | 6 | 0 |
| FEB 26 | 4.92 | 96 | 90 | 85 | 72 | 63 | 56 | 49 | 45 | 34 | 25 | 9 | 0 |
| MAR 5 | 4.88 | 96 | 91 | 80 | 67 | 65 | 57 | 52 | 46 | 33 | 18 | 6 | 0 |
| MAR 12 | 4.24 | 96 | 88 | 75 | 61 | 55 | 42 | 33 | 22 | 11 | 5 | 1 | 0 |
| MAR 19 | 5.06 | 96 | 94 | 86 | 74 | 67 | 57 | 49 | 37 | 24 | 6 | 0 | 0 |
| MAR 26 | (5.40) | 96 | 91 | 84 | 78 | 71 | 62 | 50 | 42 | 31 | 11 | 0 | 0 |
| APR 2 | 3.37 | 91 | 77 | 55 | 51 | 40 | 27 | 22 | 15 | 6 | 3 | 0 | 0 |
| APR 9 | 5.53 | 97 | 93 | 89 | 82 | 75 | 65 | 48 | 39 | 27 | 10 | 0 | 0 |
| APR 16 | 3.48 | 90 | 74 | 51 | 37 | 31 | 24 | 20 | 14 | 9 | 1 | 1 | 0 |
| APR 23 | 3.94 | 93 | 83 | 65 | 49 | 39 | 30 | 28 | 18 | 8 | 0 | 0 | 0 |
| APR 30 | 3.05 | 87 | 67 | 53 | 42 | 34 | 20 | 18 | 12 | 5 | 0 | 0 | 0 |
| MAY 7 | 3.80 | 92 | 79 | 61 | 53 | 44 | 34 | 21 | 17 | 8 | 0 | 0 | 0 |
| MAY 14 | 3.06 | 81 | 52 | 43 | 37 | 26 | 22 | 16 | 6 | 0 | 0 | 0 | 0 |
| MAY 21 | 4.77 | 94 | 88 | 81 | 70 | 62 | 50 | 37 | 21 | 5 | 0 | 0 | 0 |
| MAY 28 | (4.82) | 94 | 90 | 83 | 68 | 59 | 48 | 38 | 20 | 2 | 0 | 0 | 0 |
| JUN 4 | (3.86) | 87 | 74 | 63 | 51 | 43 | 32 | 20 | 8 | 0 | 0 | 0 | 0 |
| JUN 11 | 4.50 | 92 | 85 | 78 | 74 | 66 | 54 | 37 | 17 | 3 | 0 | 0 | 0 |
| JUN 18 | 4.72 | 94 | 89 | 83 | 75 | 66 | 52 | 36 | 11 | 0 | 0 | 0 | 0 |
| JUN 25 | 4.33 | 89 | 79 | 70 | 63 | 57 | 45 | 30 | 7 | 0 | 0 | 0 | 0 |
| JUL 2 | 3.89 | 92 | 82 | 68 | 59 | 52 | 41 | 24 | 15 | 0 | 0 | 0 | 0 |
| JUL 9 | 4.69 | 94 | 85 | 79 | 71 | 65 | 55 | 37 | 24 | 3 | 0 | 0 | 0 |
| JUL 16 | 4.36 | 93 | 82 | 72 | 64 | 56 | 45 | 36 | 26 | 4 | 0 | 0 | 0 |
| JUL 23 | 5.31 | 96 | 92 | 86 | 78 | 73 | 63 | 52 | 30 | 1 | 0 | 0 | 0 |
| JUL 30 | 5.58 | 96 | 92 | 88 | 82 | 76 | 68 | 54 | 37 | 1 | 0 | 0 | 0 |
| AUG 6 | 5.42 | 95 | 91 | 86 | 80 | 76 | 65 | 49 | 31 | 3 | 0 | 0 | 0 |
| AUG 13 | 3.12 | 89 | 69 | 46 | 35 | 27 | 21 | 17 | 15 | 10 | 4 | 0 | 0 |
| AUG 20 | 5.69 | 96 | 93 | 86 | 82 | 77 | 70 | 59 | 47 | 20 | 1 | 0 | 0 |
| AUG 27 | 5.51 | 97 | 92 | 86 | 77 | 71 | 63 | 56 | 47 | 28 | 8 | 0 | 0 |
| SEP 3 | 4.79 | 95 | 88 | 81 | 77 | 69 | 57 | 46 | 41 | 25 | 5 | 2 | 0 |
| SEP 10 | 3.26 | 65 | 52 | 49 | 45 | 41 | 35 | 32 | 25 | 14 | 0 | 0 | 0 |
| SEP 17 | 4.53 | 88 | 78 | 71 | 63 | 60 | 55 | 48 | 39 | 27 | 13 | 3 | 0 |
| SEP 24 | 5.23 | 95 | 90 | 84 | 80 | 75 | 67 | 55 | 41 | 22 | 0 | 0 | 0 |
| OCT 1 | 5.90 | 98 | 95 | 91 | 85 | 76 | 70 | 60 | 49 | 34 | 4 | 0 | 0 |
| OCT 8 | 5.51 | 98 | 94 | 86 | 78 | 71 | 62 | 53 | 42 | 31 | 1 | 0 | 0 |
| OCT 15 | 4.78 | 96 | 94 | 88 | 84 | 74 | 65 | 54 | 41 | 31 | 4 | 0 | 0 |
| OCT 22 | 4.94 | 98 | 92 | 88 | 80 | 73 | 64 | 56 | 48 | 34 | 5 | 0 | 0 |
| OCT 29 | 4.93 | 84 | 83 | 77 | 73 | 69 | 60 | 53 | 45 | 32 | 12 | 0 | 0 |
| NOV 5 | 2.87 | 69 | 64 | 60 | 54 | 48 | 36 | 24 | 16 | 6 | 0 | 0 | 0 |
| NOV 12 | 3.08 | 82 | 64 | 54 | 47 | 41 | 37 | 32 | 23 | 20 | 9 | 0 | 0 |
| NOV 19 | (1.78) | 89 | 67 | 34 | 23 | 15 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOV 26 | (1.70) | 68 | 49 | 30 | 30 | 30 | 20 | 16 | 6 | 6 | 0 | 0 | 0 |
| DEC 3 | (1.94) | 69 | 44 | 40 | 36 | 32 | 28 | 20 | 16 | 16 | 0 | 0 | 0 |
| DEC 10 | 2.55 | 76 | 67 | 60 | 51 | 51 | 45 | 35 | 31 | 26 | 0 | 0 | 0 |
| DEC 17 | 1.47 | 54 | 34 | 32 | 27 | 25 | 20 | 20 | 9 | 3 | 0 | 0 | 0 |
| DEC 24 | (3.01) | 83 | 73 | 58 | 55 | 51 | 41 | 34 | 23 | 20 | 0 | 0 | 0 |

# SOLAR RADIATION DATA for: BROWNING,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | (4.11) | 95 | 82 | 76 | 70 | 66 | 56 | 51 | 41 | 28 | 4 | 0 | 0 |
| JAN 8 | (2.57) | 89 | 65 | 44 | 38 | 31 | 27 | 24 | 18 | 11 | 2 | 0 | 0 |
| JAN 15 | (3.70) | 98 | 92 | 86 | 78 | 73 | 57 | 25 | 15 | 0 | 0 | 0 | 0 |
| JAN 22 | 2.53 | 89 | 64 | 47 | 36 | 29 | 22 | 21 | 18 | 15 | 7 | 0 | 0 |
| JAN 29 | (2.64) | 78 | 63 | 44 | 28 | 22 | 22 | 20 | 17 | 14 | 10 | 0 | 0 |
| FEB 5 | (2.32) | 81 | 53 | 35 | 33 | 25 | 25 | 19 | 14 | 10 | 7 | 0 | 0 |
| FEB 12 | 4.83 | 83 | 77 | 62 | 54 | 45 | 42 | 37 | 31 | 23 | 17 | 2 | 0 |
| FEB 19 | 4.64 | 97 | 91 | 73 | 66 | 60 | 55 | 52 | 50 | 43 | 27 | 3 | 0 |
| FEB 26 | 5.41 | 97 | 93 | 89 | 82 | 75 | 63 | 59 | 48 | 37 | 25 | 14 | 2 |
| MAR 5 | 4.73 | 97 | 88 | 80 | 72 | 62 | 56 | 49 | 37 | 28 | 16 | 6 | 2 |
| MAR 12 | (3.38) | 94 | 88 | 70 | 55 | 35 | 28 | 20 | 11 | 2 | 0 | 0 | 0 |
| MAR 19 | 3.78 | 80 | 75 | 72 | 63 | 55 | 47 | 39 | 33 | 22 | 7 | 0 | 0 |
| MAR 26 | (2.31) | 84 | 50 | 36 | 28 | 20 | 13 | 5 | 5 | 0 | 0 | 0 | 0 |
| APR 2 | 4.33 | 94 | 82 | 75 | 65 | 58 | 54 | 45 | 30 | 18 | 11 | 0 | 0 |
| APR 9 | 4.17 | 89 | 75 | 69 | 58 | 45 | 37 | 30 | 23 | 12 | 3 | 0 | 0 |
| APR 16 | 2.15 | 72 | 36 | 19 | 13 | 12 | 11 | 9 | 8 | 6 | 0 | 0 | 0 |
| APR 23 | 4.29 | 90 | 77 | 67 | 62 | 53 | 45 | 38 | 22 | 11 | 2 | 0 | 0 |
| APR 30 | 2.84 | 88 | 65 | 48 | 38 | 23 | 13 | 9 | 3 | 0 | 0 | 0 | 0 |
| MAY 7 | (5.10) | 96 | 89 | 82 | 75 | 66 | 57 | 51 | 39 | 10 | 0 | 0 | 0 |
| MAY 14 | 4.12 | 89 | 75 | 60 | 53 | 43 | 37 | 31 | 19 | 7 | 1 | 0 | 0 |
| MAY 21 | 4.73 | 83 | 75 | 71 | 63 | 53 | 48 | 40 | 35 | 21 | 2 | 0 | 0 |
| MAY 28 | 4.34 | 84 | 67 | 61 | 58 | 54 | 48 | 39 | 26 | 8 | 2 | 2 | 0 |
| JUN 4 | 5.09 | 94 | 81 | 76 | 68 | 61 | 50 | 42 | 28 | 1 | 0 | 0 | 0 |
| JUN 11 | 5.65 | 95 | 91 | 87 | 82 | 74 | 65 | 48 | 27 | 1 | 0 | 0 | 0 |
| JUN 18 | 5.16 | 95 | 90 | 85 | 80 | 71 | 60 | 46 | 22 | 3 | 0 | 0 | 0 |
| JUN 25 | 4.75 | 93 | 85 | 81 | 73 | 64 | 55 | 38 | 20 | 0 | 0 | 0 | 0 |
| JUL 2 | 2.95 | 83 | 63 | 52 | 39 | 29 | 26 | 17 | 13 | 4 | 0 | 0 | 0 |
| JUL 9 | 5.72 | 96 | 91 | 88 | 82 | 77 | 68 | 58 | 38 | 2 | 0 | 0 | 0 |
| JUL 16 | 4.04 | 88 | 71 | 58 | 53 | 45 | 40 | 33 | 27 | 5 | 0 | 0 | 0 |
| JUL 23 | 5.83 | 96 | 93 | 88 | 81 | 72 | 66 | 54 | 36 | 7 | 2 | 0 | 0 |
| JUL 30 | 5.14 | 94 | 88 | 84 | 79 | 70 | 61 | 53 | 37 | 11 | 0 | 0 | 0 |
| AUG 6 | 6.04 | 97 | 94 | 91 | 86 | 77 | 70 | 57 | 40 | 12 | 0 | 0 | 0 |
| AUG 13 | 3.69 | 92 | 68 | 53 | 45 | 38 | 34 | 29 | 23 | 12 | 4 | 0 | 0 |
| AUG 20 | 3.99 | 90 | 79 | 68 | 60 | 50 | 42 | 30 | 22 | 16 | 4 | 0 | 0 |
| AUG 27 | (5.57) | 97 | 93 | 86 | 80 | 73 | 68 | 54 | 44 | 28 | 5 | 0 | 0 |
| SEP 3 | 5.02 | 95 | 89 | 81 | 75 | 65 | 55 | 45 | 37 | 23 | 5 | 0 | 0 |
| SEP 10 | 4.09 | 75 | 67 | 61 | 58 | 53 | 48 | 37 | 29 | 21 | 5 | 0 | 0 |
| SEP 17 | 5.33 | 93 | 86 | 81 | 76 | 71 | 67 | 54 | 44 | 36 | 16 | 5 | 0 |
| SEP 24 | 4.74 | 95 | 83 | 75 | 67 | 64 | 58 | 48 | 37 | 26 | 4 | 0 | 0 |
| OCT 1 | 5.50 | 96 | 92 | 88 | 84 | 77 | 71 | 58 | 43 | 29 | 4 | 0 | 0 |
| OCT 8 | 5.26 | 98 | 93 | 89 | 81 | 72 | 61 | 46 | 40 | 25 | 8 | 0 | 0 |
| OCT 15 | 4.08 | 88 | 80 | 77 | 66 | 59 | 45 | 41 | 36 | 25 | 3 | 0 | 0 |
| OCT 22 | 3.56 | 83 | 69 | 65 | 56 | 49 | 41 | 29 | 20 | 12 | 3 | 0 | 0 |
| OCT 29 | (4.70) | 98 | 93 | 90 | 86 | 74 | 66 | 48 | 29 | 10 | 0 | 0 | 0 |
| NOV 5 | | | | | | | | | | | | | |
| NOV 12 | | | | | | | | | | | | | |
| NOV 19 | | | | | | | | | | | | | |
| NOV 26 | | | | | | | | | | | | | |
| DEC 3 | | | | | | | | | | | | | |
| DEC 10 | | | | | | | | | | | | | |
| DEC 17 | | | | | | | | | | | | | |
| DEC 24 | | | | | | | | | | | | | |

SOLAR RADIATION DATA for: BUTTE, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 3.34 | 94 | 81 | 73 | 65 | 58 | 48 | 36 | 31 | 20 | 0 | 0 | 0 |
| JAN 8 | 1.02 | 76 | 32 | 13 | 7 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAN 15 | (2.49) | 82 | 58 | 49 | 42 | 34 | 26 | 22 | 17 | 8 | 3 | 0 | 0 |
| JAN 22 | 2.64 | 92 | 64 | 46 | 40 | 37 | 30 | 28 | 18 | 11 | 3 | 0 | 0 |
| JAN 29 | 3.17 | 93 | 74 | 62 | 57 | 49 | 37 | 28 | 20 | 10 | 3 | 0 | 0 |
| FEB 5 | 2.05 | 87 | 55 | 37 | 25 | 23 | 17 | 14 | 11 | 6 | 3 | 0 | 0 |
| FEB 12 | 4.49 | 95 | 81 | 76 | 70 | 65 | 57 | 48 | 37 | 26 | 13 | 0 | 0 |
| FEB 19 | 4.20 | 96 | 82 | 75 | 71 | 64 | 53 | 45 | 36 | 29 | 7 | 0 | 0 |
| FEB 26 | 5.12 | 97 | 92 | 90 | 81 | 74 | 64 | 59 | 50 | 35 | 14 | 4 | 1 |
| MAR 5 | 4.62 | 94 | 82 | 77 | 69 | 64 | 59 | 50 | 40 | 26 | 18 | 5 | 0 |
| MAR 12 | (4.13) | 95 | 83 | 69 | 53 | 46 | 35 | 28 | 25 | 17 | 2 | 0 | 0 |
| MAR 19 | 4.75 | 96 | 89 | 83 | 71 | 62 | 52 | 44 | 34 | 23 | 6 | 0 | 0 |
| MAR 26 | 5.36 | 97 | 91 | 80 | 76 | 67 | 61 | 53 | 42 | 32 | 4 | 0 | 0 |
| APR 2 | 3.55 | 93 | 79 | 65 | 52 | 44 | 30 | 27 | 19 | 10 | 7 | 4 | 0 |
| APR 9 | 5.64 | 96 | 92 | 88 | 80 | 74 | 68 | 54 | 36 | 22 | 13 | 1 | 0 |
| APR 16 | 4.23 | 96 | 87 | 72 | 60 | 52 | 38 | 22 | 18 | 9 | 2 | 0 | 0 |
| APR 23 | 3.73 | 93 | 78 | 67 | 53 | 41 | 30 | 23 | 21 | 10 | 5 | 0 | 0 |
| APR 30 | 2.92 | 84 | 56 | 48 | 40 | 29 | 24 | 18 | 7 | 2 | 0 | 0 | 0 |
| MAY 7 | 3.56 | 92 | 77 | 53 | 44 | 40 | 33 | 24 | 17 | 6 | 0 | 0 | 0 |
| MAY 14 | (3.38) | 92 | 75 | 52 | 35 | 24 | 16 | 15 | 13 | 6 | 0 | 0 | 0 |
| MAY 21 | | | | | | | | | | | | | |
| MAY 28 | | | | | | | | | | | | | |
| JUN 4 | | | | | | | | | | | | | |
| JUN 11 | | | | | | | | | | | | | |
| JUN 18 | | | | | | | | | | | | | |
| JUN 25 | | | | | | | | | | | | | |
| JUL 2 | | | | | | | | | | | | | |
| JUL 9 | | | | | | | | | | | | | |
| JUL 16 | | | | | | | | | | | | | |
| JUL 23 | | | | | | | | | | | | | |
| JUL 30 | | | | | | | | | | | | | |
| AUG 6 | | | | | | | | | | | | | |
| AUG 13 | | | | | | | | | | | | | |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | | | | | | | | | | | | | |
| SEP 3 | | | | | | | | | | | | | |
| SEP 10 | | | | | | | | | | | | | |
| SEP 17 | | | | | | | | | | | | | |
| SEP 24 | | | | | | | | | | | | | |
| OCT 1 | | | | | | | | | | | | | |
| OCT 8 | | | | | | | | | | | | | |
| OCT 15 | | | | | | | | | | | | | |
| OCT 22 | (3.65) | 95 | 68 | 58 | 47 | 43 | 43 | 38 | 32 | 26 | 0 | 0 | 0 |
| OCT 29 | 4.52 | 91 | 85 | 77 | 74 | 65 | 61 | 54 | 43 | 29 | 4 | 0 | 0 |
| NOV 5 | 2.62 | 69 | 54 | 51 | 48 | 41 | 30 | 21 | 13 | 7 | 4 | 0 | 0 |
| NOV 12 | 2.87 | 88 | 65 | 51 | 45 | 41 | 39 | 29 | 23 | 15 | 2 | 0 | 0 |
| NOV 19 | 2.59 | 86 | 63 | 55 | 49 | 38 | 30 | 23 | 17 | 10 | 2 | 0 | 0 |
| NOV 26 | 2.38 | 85 | 60 | 53 | 46 | 39 | 35 | 29 | 27 | 14 | 0 | 0 | 0 |
| DEC 3 | 1.98 | 72 | 48 | 43 | 39 | 34 | 24 | 21 | 16 | 12 | 4 | 0 | 0 |
| DEC 10 | 3.27 | 94 | 80 | 69 | 61 | 52 | 43 | 39 | 29 | 23 | 5 | 0 | 0 |
| DEC 17 | 2.03 | 83 | 47 | 38 | 33 | 32 | 26 | 25 | 25 | 23 | 1 | 0 | 0 |
| DEC 24 | 3.09 | 83 | 74 | 69 | 66 | 56 | 48 | 35 | 20 | 6 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: CHOTEAU,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | | | | | | | | | | | | | |
| FEB 19 | | | | | | | | | | | | | |
| FEB 26 | | | | | | | | | | | | | |
| MAR 5 | | | | | | | | | | | | | |
| MAR 12 | (4.31) | 97 | 90 | 82 | 70 | 60 | 56 | 46 | 34 | 24 | 12 | 8 | 0 |
| MAR 19 | 4.43 | 82 | 70 | 67 | 64 | 60 | 56 | 52 | 43 | 33 | 21 | 3 | 0 |
| MAR 26 | 3.20 | 86 | 63 | 50 | 38 | 33 | 27 | 19 | 15 | 9 | 3 | 0 | 0 |
| APR 2 | (5.17) | 96 | 90 | 82 | 74 | 64 | 57 | 47 | 40 | 32 | 21 | 2 | 0 |
| APR 9 | 5.09 | 94 | 82 | 74 | 68 | 63 | 58 | 51 | 44 | 32 | 14 | 1 | 0 |
| APR 16 | 2.73 | 87 | 53 | 33 | 25 | 20 | 16 | 15 | 11 | 6 | 1 | 0 | 0 |
| APR 23 | 4.64 | 94 | 77 | 66 | 57 | 50 | 46 | 40 | 34 | 28 | 16 | 7 | 1 |
| APR 30 | 3.20 | 84 | 65 | 51 | 36 | 31 | 21 | 17 | 12 | 10 | 4 | 0 | 0 |
| MAY 7 | 4.88 | 96 | 88 | 79 | 68 | 63 | 58 | 49 | 39 | 21 | 2 | 0 | 0 |
| MAY 14 | 3.98 | 89 | 74 | 62 | 52 | 44 | 38 | 33 | 26 | 14 | 0 | 0 | 0 |
| MAY 21 | (4.14) | 90 | 73 | 64 | 57 | 50 | 44 | 35 | 29 | 12 | 3 | 0 | 0 |
| MAY 28 | (4.06) | 89 | 70 | 62 | 55 | 49 | 43 | 34 | 20 | 6 | 1 | 0 | 0 |
| JUN 4 | 5.27 | 96 | 91 | 83 | 73 | 64 | 53 | 42 | 28 | 5 | 0 | 0 | 0 |
| JUN 11 | 5.06 | 96 | 89 | 80 | 72 | 65 | 56 | 45 | 30 | 7 | 1 | 0 | 0 |
| JUN 18 | 4.66 | 95 | 88 | 79 | 70 | 61 | 52 | 38 | 23 | 8 | 3 | 0 | 0 |
| JUN 25 | 4.54 | 93 | 85 | 75 | 67 | 59 | 48 | 37 | 18 | 1 | 0 | 0 | 0 |
| JUL 2 | 2.66 | 82 | 57 | 45 | 35 | 28 | 21 | 14 | 6 | 0 | 0 | 0 | 0 |
| JUL 9 | 5.47 | 96 | 90 | 87 | 81 | 76 | 66 | 56 | 34 | 5 | 0 | 0 | 0 |
| JUL 16 | 4.18 | 91 | 77 | 66 | 59 | 47 | 44 | 40 | 28 | 12 | 2 | 0 | 0 |
| JUL 23 | 5.53 | 95 | 91 | 88 | 83 | 75 | 66 | 50 | 29 | 4 | 0 | 0 | 0 |
| JUL 30 | 5.14 | 96 | 91 | 83 | 77 | 71 | 60 | 48 | 33 | 3 | 1 | 0 | 0 |
| AUG 6 | (5.78) | 96 | 93 | 89 | 83 | 75 | 66 | 51 | 39 | 0 | 0 | 0 | 0 |
| AUG 13 | 3.45 | 88 | 57 | 44 | 35 | 31 | 28 | 25 | 18 | 12 | 1 | 0 | 0 |
| AUG 20 | 5.15 | 96 | 91 | 86 | 77 | 71 | 59 | 46 | 38 | 18 | 2 | 0 | 0 |
| AUG 27 | (5.89) | 96 | 93 | 91 | 83 | 78 | 68 | 60 | 52 | 35 | 6 | 0 | 0 |
| SEP 3 | (5.83) | 98 | 93 | 91 | 85 | 81 | 72 | 66 | 52 | 15 | 0 | 0 | 0 |
| SEP 10 | 3.68 | 68 | 61 | 56 | 51 | 46 | 41 | 34 | 27 | 14 | 2 | 0 | 0 |
| SEP 17 | (5.02) | 78 | 76 | 73 | 70 | 66 | 61 | 54 | 43 | 28 | 0 | 0 | 0 |
| SEP 24 | 4.16 | 91 | 79 | 69 | 63 | 53 | 46 | 35 | 26 | 15 | 1 | 0 | 0 |
| OCT 1 | 5.63 | 96 | 90 | 87 | 84 | 77 | 69 | 56 | 43 | 27 | 6 | 0 | 0 |
| OCT 8 | 5.03 | 98 | 93 | 87 | 74 | 64 | 53 | 45 | 33 | 17 | 0 | 0 | 0 |
| OCT 15 | 3.98 | 81 | 67 | 64 | 61 | 56 | 48 | 38 | 27 | 14 | 0 | 0 | 0 |
| OCT 22 | 3.66 | 93 | 82 | 70 | 61 | 52 | 41 | 31 | 21 | 9 | 0 | 0 | 0 |
| OCT 29 | (5.04) | 98 | 95 | 90 | 84 | 78 | 70 | 52 | 41 | 22 | 0 | 0 | 0 |
| NOV 5 | ( .73) | 64 | 15 | 12 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOV 12 | (2.80) | 68 | 61 | 57 | 53 | 48 | 43 | 39 | 32 | 18 | 0 | 0 | 0 |
| NOV 19 | (2.79) | 69 | 54 | 49 | 47 | 40 | 33 | 33 | 23 | 12 | 0 | 0 | 0 |
| NOV 26 | 2.75 | 91 | 76 | 65 | 55 | 47 | 44 | 28 | 21 | 1 | 0 | 0 | 0 |
| DEC 3 | 1.69 | 76 | 45 | 37 | 31 | 25 | 16 | 11 | 6 | 0 | 0 | 0 | 0 |
| DEC 10 | 3.17 | 95 | 83 | 82 | 78 | 70 | 58 | 50 | 39 | 8 | 0 | 0 | 0 |
| DEC 17 | 3.19 | 91 | 80 | 72 | 61 | 55 | 46 | 39 | 28 | 6 | 0 | 0 | 0 |
| DEC 24 | 2.29 | 85 | 59 | 53 | 45 | 40 | 30 | 21 | 16 | 3 | 0 | 0 | 0 |

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | | | | | | | | | | | | | |
| FEB 19 | | | | | | | | | | | | | |
| FEB 26 | (4.94) | 97 | 88 | 82 | 76 | 56 | 52 | 42 | 21 | 18 | 4 | 0 | 0 |
| MAR 5 | (5.91) | 97 | 95 | 91 | 87 | 78 | 71 | 66 | 56 | 44 | 20 | 0 | 0 |
| MAR 12 | 4.57 | 97 | 90 | 76 | 62 | 57 | 51 | 43 | 36 | 22 | 10 | 0 | 0 |
| MAR 19 | 4.38 | 92 | 77 | 62 | 54 | 52 | 48 | 44 | 37 | 21 | 4 | 0 | 0 |
| MAR 26 | 4.98 | 96 | 92 | 83 | 72 | 62 | 49 | 40 | 30 | 20 | 1 | 0 | 0 |
| APR 2 | 5.30 | 96 | 93 | 86 | 77 | 72 | 65 | 47 | 30 | 23 | 3 | 0 | 0 |
| APR 9 | 4.63 | 81 | 73 | 69 | 62 | 57 | 52 | 45 | 35 | 27 | 10 | 1 | 0 |
| APR 16 | 3.48 | 89 | 63 | 48 | 39 | 31 | 29 | 27 | 20 | 11 | 1 | 0 | 0 |
| APR 23 | 3.91 | 74 | 65 | 61 | 55 | 46 | 40 | 34 | 25 | 13 | 0 | 0 | 0 |
| APR 30 | (3.88) | 93 | 74 | 59 | 50 | 42 | 28 | 17 | 10 | 5 | 0 | 0 | 0 |
| MAY 7 | (5.72) | 94 | 91 | 89 | 82 | 82 | 82 | 65 | 45 | 0 | 0 | 0 | 0 |
| MAY 14 | 2.76 | 64 | 55 | 42 | 33 | 28 | 25 | 21 | 14 | 0 | 0 | 0 | 0 |
| MAY 21 | 5.55 | 95 | 91 | 85 | 81 | 75 | 69 | 55 | 32 | 2 | 0 | 0 | 0 |
| MAY 28 | 3.61 | 85 | 65 | 57 | 51 | 45 | 34 | 21 | 12 | 4 | 0 | 0 | 0 |
| JUN 4 | 4.77 | 93 | 88 | 80 | 72 | 67 | 56 | 41 | 21 | 0 | 0 | 0 | 0 |
| JUN 11 | 4.74 | 94 | 89 | 80 | 71 | 62 | 55 | 44 | 21 | 10 | 0 | 0 | 0 |
| JUN 18 | 4.89 | 94 | 88 | 78 | 72 | 66 | 60 | 44 | 12 | 0 | 0 | 0 | 0 |
| JUN 25 | 4.62 | 92 | 83 | 78 | 71 | 64 | 59 | 44 | 19 | 1 | 0 | 0 | 0 |
| JUL 2 | 4.19 | 94 | 86 | 71 | 62 | 51 | 43 | 33 | 15 | 4 | 0 | 0 | 0 |
| JUL 9 | (5.11) | 94 | 88 | 83 | 75 | 66 | 57 | 43 | 20 | 0 | 0 | 0 | 0 |
| JUL 16 | 3.72 | 85 | 64 | 52 | 46 | 41 | 36 | 24 | 14 | 1 | 0 | 0 | 0 |
| JUL 23 | 4.83 | 94 | 88 | 81 | 75 | 63 | 55 | 42 | 24 | 0 | 0 | 0 | 0 |
| JUL 30 | 5.19 | 93 | 84 | 80 | 73 | 68 | 59 | 51 | 35 | 6 | 0 | 0 | 0 |
| AUG 6 | 5.68 | 96 | 93 | 90 | 83 | 74 | 66 | 52 | 32 | 2 | 0 | 0 | 0 |
| AUG 13 | 4.50 | 91 | 83 | 74 | 67 | 57 | 51 | 44 | 30 | 15 | 0 | 0 | 0 |
| AUG 20 | 5.75 | 95 | 94 | 90 | 85 | 79 | 70 | 58 | 41 | 15 | 0 | 0 | 0 |
| AUG 27 | 5.17 | 91 | 88 | 83 | 74 | 71 | 64 | 55 | 36 | 19 | 0 | 0 | 0 |
| SEP 3 | 5.38 | 96 | 92 | 90 | 85 | 78 | 68 | 57 | 41 | 19 | 2 | 0 | 0 |
| SEP 10 | (3.78) | 96 | 83 | 78 | 61 | 42 | 27 | 10 | 10 | 0 | 0 | 0 | 0 |
| SEP 17 | (6.78) | 99 | 97 | 92 | 91 | 87 | 79 | 68 | 55 | 41 | 7 | 0 | 0 |
| SEP 24 | 6.03 | 98 | 95 | 93 | 88 | 80 | 74 | 65 | 49 | 35 | 4 | 0 | 0 |
| OCT 1 | 5.52 | 96 | 93 | 89 | 83 | 74 | 64 | 56 | 39 | 31 | 8 | 2 | 0 |
| OCT 8 | 5.53 | 97 | 95 | 91 | 86 | 79 | 67 | 57 | 45 | 35 | 5 | 0 | 0 |
| OCT 15 | 4.10 | 80 | 66 | 62 | 56 | 54 | 48 | 40 | 31 | 23 | 2 | 0 | 0 |
| OCT 22 | 4.57 | 94 | 91 | 87 | 78 | 70 | 63 | 54 | 37 | 24 | 4 | 0 | 0 |
| OCT 29 | 4.96 | 97 | 91 | 81 | 76 | 69 | 63 | 53 | 42 | 27 | 3 | 0 | 0 |
| NOV 5 | 2.76 | 77 | 66 | 47 | 39 | 30 | 27 | 20 | 15 | 8 | 3 | 0 | 0 |
| NOV 12 | (4.07) | 89 | 70 | 59 | 53 | 49 | 48 | 40 | 35 | 25 | 10 | 0 | 0 |
| NOV 19 | (5.29) | 99 | 97 | 94 | 90 | 81 | 76 | 63 | 48 | 33 | 4 | 0 | 0 |
| NOV 26 | 1.73 | 86 | 65 | 45 | 31 | 18 | 9 | 2 | 0 | 0 | 0 | 0 | 0 |
| DEC 3 | (2.79) | 87 | 67 | 54 | 47 | 38 | 38 | 32 | 27 | 15 | 2 | 0 | 0 |
| DEC 10 | | | | | | | | | | | | | |
| DEC 17 | | | | | | | | | | | | | |
| DEC 24 | | | | | | | | | | | | | |

# SOLAR RADIATION DATA for: DILLON, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 3.19 | 96 | 87 | 70 | 60 | 53 | 48 | 30 | 26 | 11 | 0 | 0 | 0 |
| JAN 8 | 1.81 | 76 | 62 | 42 | 32 | 23 | 17 | 9 | 4 | 1 | 0 | 0 | 0 |
| JAN 15 | (2.32) | 80 | 65 | 57 | 53 | 39 | 39 | 31 | 26 | 20 | 6 | 0 | 0 |
| JAN 22 | 2.24 | 80 | 53 | 44 | 36 | 29 | 27 | 20 | 13 | 5 | 0 | 0 | 0 |
| JAN 29 | (3.92) | 97 | 91 | 83 | 77 | 75 | 68 | 53 | 39 | 14 | 0 | 0 | 0 |
| FEB 5 | 2.83 | 76 | 52 | 49 | 44 | 39 | 34 | 31 | 25 | 17 | 9 | 2 | 0 |
| FEB 12 | 5.08 | 97 | 92 | 88 | 80 | 72 | 63 | 52 | 43 | 33 | 28 | 1 | 0 |
| FEB 19 | 5.29 | 93 | 84 | 80 | 77 | 71 | 67 | 59 | 51 | 43 | 29 | 1 | 0 |
| FEB 26 | 4.90 | 96 | 88 | 79 | 71 | 60 | 55 | 47 | 37 | 26 | 14 | 0 | 0 |
| MAR 5 | (4.76) | 95 | 90 | 79 | 74 | 69 | 58 | 48 | 37 | 29 | 15 | 2 | 0 |
| MAR 12 | 4.96 | 97 | 92 | 83 | 79 | 71 | 59 | 52 | 37 | 27 | 8 | 0 | 0 |
| MAR 19 | 6.01 | 97 | 94 | 90 | 85 | 83 | 79 | 71 | 61 | 52 | 27 | 0 | 0 |
| MAR 26 | 5.83 | 96 | 91 | 83 | 78 | 70 | 65 | 60 | 52 | 41 | 21 | 1 | 0 |
| APR 2 | 3.92 | 92 | 77 | 64 | 50 | 38 | 28 | 23 | 22 | 16 | 7 | 0 | 0 |
| APR 9 | (6.50) | 98 | 95 | 90 | 86 | 81 | 76 | 66 | 56 | 43 | 13 | 0 | 0 |
| APR 16 | | | | | | | | | | | | | |
| APR 23 | (3.81) | 92 | 83 | 70 | 55 | 43 | 35 | 27 | 16 | 10 | 4 | 0 | 0 |
| APR 30 | 3.30 | 90 | 73 | 56 | 35 | 30 | 25 | 20 | 15 | 7 | 3 | 0 | 0 |
| MAY 7 | 3.85 | 95 | 88 | 75 | 52 | 43 | 36 | 27 | 17 | 10 | 1 | 0 | 0 |
| MAY 14 | 3.72 | 83 | 72 | 61 | 47 | 41 | 36 | 27 | 17 | 3 | 0 | 0 | 0 |
| MAY 21 | 4.12 | 92 | 82 | 75 | 59 | 50 | 39 | 24 | 11 | 3 | 0 | 0 | 0 |
| MAY 28 | 4.91 | 95 | 91 | 79 | 70 | 59 | 42 | 27 | 14 | 2 | 0 | 0 | 0 |
| JUN 4 | 5.26 | 94 | 89 | 79 | 71 | 64 | 54 | 44 | 22 | 0 | 0 | 0 | 0 |
| JUN 11 | 4.69 | 94 | 89 | 81 | 72 | 63 | 50 | 33 | 12 | 0 | 0 | 0 | 0 |
| JUN 18 | 5.03 | 93 | 88 | 79 | 78 | 71 | 59 | 51 | 28 | 6 | 0 | 0 | 0 |
| JUN 25 | 5.10 | 95 | 91 | 83 | 73 | 63 | 54 | 35 | 20 | 3 | 0 | 0 | 0 |
| JUL 2 | 3.98 | 91 | 83 | 70 | 57 | 48 | 39 | 31 | 14 | 0 | 0 | 0 | 0 |
| JUL 9 | 4.69 | 94 | 89 | 80 | 72 | 59 | 45 | 34 | 23 | 5 | 0 | 0 | 0 |
| JUL 16 | (5.13) | 94 | 90 | 84 | 71 | 68 | 59 | 48 | 29 | 0 | 0 | 0 | 0 |
| JUL 23 | 4.94 | 94 | 90 | 85 | 73 | 66 | 53 | 38 | 17 | 1 | 0 | 0 | 0 |
| JUL 30 | 5.64 | 96 | 94 | 89 | 82 | 76 | 65 | 50 | 25 | 0 | 0 | 0 | 0 |
| AUG 6 | 5.21 | 96 | 92 | 84 | 75 | 67 | 55 | 43 | 17 | 0 | 0 | 0 | 0 |
| AUG 13 | 3.65 | 90 | 73 | 66 | 52 | 43 | 32 | 21 | 16 | 8 | 0 | 0 | 0 |
| AUG 20 | 4.96 | 96 | 91 | 84 | 75 | 66 | 58 | 44 | 29 | 17 | 1 | 0 | 0 |
| AUG 27 | (4.31) | 96 | 93 | 87 | 60 | 54 | 51 | 38 | 28 | 17 | 0 | 0 | 0 |
| SEP 3 | | | | | | | | | | | | | |
| SEP 10 | (5.71) | 98 | 93 | 82 | 72 | 69 | 60 | 58 | 44 | 35 | 15 | 2 | 0 |
| SEP 17 | 5.28 | 96 | 90 | 78 | 74 | 70 | 64 | 59 | 50 | 36 | 20 | 1 | 0 |
| SEP 24 | 5.49 | 96 | 94 | 89 | 84 | 76 | 71 | 58 | 37 | 24 | 2 | 0 | 0 |
| OCT 1 | 6.53 | 99 | 97 | 95 | 91 | 85 | 78 | 68 | 53 | 38 | 13 | 0 | 0 |
| OCT 8 | 6.56 | 98 | 96 | 92 | 89 | 83 | 75 | 67 | 57 | 43 | 23 | 0 | 0 |
| OCT 15 | 4.88 | 96 | 92 | 88 | 81 | 73 | 62 | 50 | 35 | 22 | 11 | 0 | 0 |
| OCT 22 | 6.01 | 98 | 97 | 92 | 86 | 82 | 76 | 69 | 59 | 40 | 13 | 0 | 0 |
| OCT 29 | 5.56 | 98 | 95 | 90 | 85 | 81 | 73 | 65 | 56 | 38 | 19 | 0 | 0 |
| NOV 5 | 3.67 | 88 | 78 | 72 | 64 | 61 | 53 | 41 | 29 | 18 | 11 | 0 | 0 |
| NOV 12 | (4.37) | 96 | 82 | 69 | 62 | 57 | 54 | 50 | 43 | 34 | 17 | 0 | 0 |
| NOV 19 | (2.15) | 76 | 67 | 54 | 47 | 38 | 31 | 20 | 13 | 7 | 0 | 0 | 0 |
| NOV 26 | 2.61 | 81 | 55 | 49 | 47 | 44 | 35 | 31 | 31 | 23 | 8 | 0 | 0 |
| DEC 3 | 2.75 | 91 | 68 | 58 | 57 | 52 | 40 | 30 | 22 | 14 | 7 | 0 | 0 |
| DEC 10 | 4.27 | 96 | 93 | 86 | 83 | 77 | 71 | 64 | 52 | 30 | 6 | 0 | 0 |
| DEC 17 | 2.44 | 87 | 70 | 58 | 48 | 44 | 39 | 30 | 25 | 17 | 3 | 0 | 0 |
| DEC 24 | 4.24 | 93 | 83 | 79 | 76 | 74 | 72 | 58 | 48 | 33 | 10 | 0 | 0 |

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | | | | | | | | | | | | | |
| FEB 19 | 5.06 | 96 | 91 | 83 | 72 | 67 | 60 | 56 | 51 | 39 | 25 | 4 | 0 |
| FEB 26 | 5.03 | 96 | 87 | 80 | 73 | 69 | 60 | 53 | 48 | 35 | 21 | 4 | 0 |
| MAR 5 | 4.65 | 95 | 88 | 79 | 71 | 63 | 57 | 48 | 36 | 23 | 13 | 0 | 0 |
| MAR 12 | 4.99 | 96 | 88 | 81 | 72 | 61 | 51 | 43 | 37 | 25 | 13 | 8 | 0 |
| MAR 19 | 5.08 | 97 | 92 | 86 | 76 | 65 | 55 | 38 | 29 | 21 | 10 | 0 | 0 |
| MAR 26 | 5.56 | 97 | 89 | 84 | 77 | 69 | 61 | 52 | 45 | 32 | 13 | 0 | 0 |
| APR 2 | 3.52 | 89 | 79 | 63 | 51 | 43 | 40 | 28 | 19 | 17 | 12 | 10 | 0 |
| APR 9 | 5.75 | 97 | 91 | 88 | 82 | 75 | 63 | 51 | 42 | 27 | 11 | 0 | 0 |
| APR 16 | (4.31) | 94 | 82 | 73 | 56 | 45 | 37 | 34 | 27 | 19 | 7 | 0 | 0 |
| APR 23 | (5.08) | 95 | 88 | 79 | 64 | 54 | 50 | 40 | 37 | 26 | 5 | 0 | 0 |
| APR 30 | (3.76) | 93 | 81 | 61 | 47 | 39 | 30 | 21 | 14 | 4 | 0 | 0 | 0 |
| MAY 7 | 4.50 | 95 | 87 | 76 | 63 | 55 | 47 | 30 | 23 | 11 | 2 | 0 | 0 |
| MAY 14 | 3.29 | 73 | 59 | 48 | 42 | 28 | 25 | 19 | 12 | 6 | 0 | 0 | 0 |
| MAY 21 | 4.48 | 94 | 89 | 74 | 65 | 50 | 41 | 24 | 15 | 0 | 0 | 0 | 0 |
| MAY 28 | 4.79 | 94 | 85 | 77 | 68 | 56 | 46 | 36 | 26 | 8 | 0 | 0 | 0 |
| JUN 4 | 4.71 | 89 | 77 | 70 | 64 | 57 | 51 | 41 | 27 | 2 | 0 | 0 | 0 |
| JUN 11 | 4.03 | 90 | 79 | 67 | 58 | 50 | 39 | 30 | 20 | 8 | 0 | 0 | 0 |
| JUN 18 | (4.66) | 94 | 90 | 85 | 73 | 63 | 49 | 41 | 23 | 0 | 0 | 0 | 0 |
| JUN 25 | | | | | | | | | | | | | |
| JUL 2 | | | | | | | | | | | | | |
| JUL 9 | | | | | | | | | | | | | |
| JUL 16 | (4.63) | 99 | 95 | 92 | 88 | 83 | 72 | 51 | 13 | 0 | 0 | 0 | 0 |
| JUL 23 | (3.60) | 97 | 93 | 89 | 83 | 70 | 56 | 37 | 9 | 4 | 0 | 0 | 0 |
| JUL 30 | | | | | | | | | | | | | |
| AUG 6 | | | | | | | | | | | | | |
| AUG 13 | | | | | | | | | | | | | |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | | | | | | | | | | | | | |
| SEP 3 | | | | | | | | | | | | | |
| SEP 10 | | | | | | | | | | | | | |
| SEP 17 | | | | | | | | | | | | | |
| SEP 24 | (6.42) | 99 | 96 | 94 | 85 | 76 | 68 | 63 | 51 | 33 | 0 | 0 | 0 |
| OCT 1 | 6.11 | 99 | 96 | 92 | 87 | 82 | 73 | 63 | 48 | 33 | 4 | 0 | 0 |
| OCT 8 | 5.73 | 99 | 93 | 85 | 80 | 76 | 66 | 60 | 50 | 39 | 6 | 0 | 0 |
| OCT 15 | 4.43 | 97 | 92 | 80 | 73 | 67 | 57 | 46 | 39 | 23 | 2 | 0 | 0 |
| OCT 22 | 5.41 | 99 | 95 | 89 | 84 | 80 | 74 | 69 | 56 | 37 | 5 | 0 | 0 |
| OCT 29 | (4.55) | 78 | 66 | 64 | 61 | 60 | 54 | 47 | 41 | 32 | 10 | 0 | 0 |
| NOV 5 | (2.29) | 89 | 65 | 50 | 46 | 41 | 24 | 10 | 0 | 0 | 0 | 0 | 0 |
| NOV 12 | 2.88 | 85 | 58 | 45 | 39 | 38 | 34 | 28 | 25 | 20 | 8 | 0 | 0 |
| NOV 19 | 2.90 | 92 | 60 | 50 | 46 | 40 | 33 | 30 | 23 | 12 | 0 | 0 | 0 |
| NOV 26 | 1.98 | 82 | 49 | 36 | 27 | 22 | 22 | 20 | 17 | 11 | 2 | 2 | 0 |
| DEC 3 | 2.38 | 75 | 50 | 46 | 36 | 34 | 32 | 28 | 21 | 14 | 0 | 0 | 0 |
| DEC 10 | 3.58 | 94 | 84 | 79 | 72 | 66 | 58 | 48 | 40 | 18 | 2 | 0 | 0 |
| DEC 17 | (1.76) | 87 | 64 | 59 | 52 | 37 | 23 | 15 | 9 | 0 | 0 | 0 | 0 |
| DEC 24 | 3.27 | 94 | 84 | 74 | 62 | 59 | 44 | 38 | 28 | 16 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: FORT BENTON, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Foulkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | | | | | | | | | | | | | |
| FEB 19 | 4.12 | 94 | 80 | 76 | 70 | 64 | 59 | 53 | 38 | 27 | 8 | 0 | 0 |
| FEB 26 | 4.82 | 97 | 93 | 88 | 76 | 66 | 59 | 51 | 40 | 25 | 12 | 0 | 0 |
| MAR 5 | 4.32 | 97 | 92 | 78 | 67 | 55 | 45 | 38 | 25 | 18 | 5 | 0 | 0 |
| MAR 12 | 3.58 | 93 | 68 | 55 | 48 | 43 | 41 | 34 | 27 | 17 | 9 | 0 | 0 |
| MAR 19 | (4.34) | 94 | 84 | 78 | 66 | 60 | 53 | 45 | 28 | 14 | 8 | 0 | 0 |
| MAR 26 | 3.38 | 90 | 72 | 60 | 45 | 40 | 34 | 23 | 17 | 7 | 0 | 0 | 0 |
| APR 2 | 4.22 | 91 | 82 | 74 | 65 | 61 | 52 | 39 | 29 | 22 | 8 | 0 | 0 |
| APR 9 | 4.41 | 94 | 84 | 75 | 69 | 62 | 45 | 35 | 22 | 10 | 2 | 0 | 0 |
| APR 16 | (2.55) | 74 | 45 | 43 | 41 | 35 | 22 | 14 | 5 | 0 | 0 | 0 | 0 |
| APR 23 | (2.06) | 86 | 41 | 20 | 16 | 9 | 9 | 9 | 0 | 0 | 0 | 0 | 0 |
| APR 30 | 3.00 | 86 | 65 | 48 | 42 | 35 | 28 | 26 | 18 | 5 | 0 | 0 | 0 |
| MAY 7 | 3.74 | 91 | 76 | 65 | 57 | 42 | 30 | 23 | 21 | 15 | 1 | 0 | 0 |
| MAY 14 | 3.40 | 74 | 61 | 57 | 44 | 36 | 32 | 25 | 12 | 0 | 0 | 0 | 0 |
| MAY 21 | 4.14 | 92 | 83 | 73 | 64 | 54 | 42 | 36 | 19 | 2 | 0 | 0 | 0 |
| MAY 28 | 4.03 | 85 | 75 | 65 | 60 | 50 | 36 | 27 | 8 | 1 | 0 | 0 | 0 |
| JUN 4 | 4.99 | 94 | 87 | 81 | 75 | 62 | 54 | 41 | 15 | 0 | 0 | 0 | 0 |
| JUN 11 | (4.16) | 91 | 84 | 77 | 66 | 55 | 41 | 34 | 9 | 0 | 0 | 0 | 0 |
| JUN 18 | | | | | | | | | | | | | |
| JUN 25 | | | | | | | | | | | | | |
| JUL 2 | | | | | | | | | | | | | |
| JUL 9 | | | | | | | | | | | | | |
| JUL 16 | (4.88) | 93 | 88 | 70 | 63 | 58 | 53 | 40 | 31 | 6 | 0 | 0 | 0 |
| JUL 23 | 5.85 | 96 | 92 | 88 | 85 | 76 | 66 | 53 | 35 | 1 | 0 | 0 | 0 |
| JUL 30 | 5.11 | 95 | 90 | 85 | 78 | 71 | 61 | 45 | 26 | 0 | 0 | 0 | 0 |
| AUG 6 | 5.60 | 96 | 93 | 86 | 80 | 72 | 62 | 49 | 27 | 2 | 0 | 0 | 0 |
| AUG 13 | 3.79 | 84 | 70 | 54 | 49 | 41 | 34 | 28 | 22 | 9 | 0 | 0 | 0 |
| AUG 20 | 5.71 | 97 | 93 | 88 | 84 | 76 | 69 | 52 | 38 | 17 | 2 | 0 | 0 |
| AUG 27 | 6.05 | 98 | 94 | 90 | 86 | 81 | 75 | 65 | 51 | 28 | 1 | 1 | 0 |
| SEP 3 | 4.83 | 95 | 92 | 84 | 77 | 69 | 60 | 49 | 41 | 24 | 2 | 0 | 0 |
| SEP 10 | (1.09) | 46 | 28 | 18 | 15 | 9 | 5 | 5 | 0 | 0 | 0 | 0 | 0 |
| SEP 17 | | | | | | | | | | | | | |
| SEP 24 | (4.98) | 97 | 93 | 89 | 77 | 70 | 62 | 45 | 36 | 10 | 0 | 0 | 0 |
| OCT 1 | 4.80 | 97 | 92 | 83 | 74 | 62 | 57 | 44 | 35 | 23 | 7 | 0 | 0 |
| OCT 8 | 4.94 | 98 | 93 | 86 | 79 | 71 | 60 | 51 | 38 | 17 | 0 | 0 | 0 |
| OCT 15 | (3.51) | 78 | 67 | 64 | 56 | 53 | 50 | 41 | 31 | 18 | 0 | 0 | 0 |
| OCT 22 | 3.76 | 88 | 73 | 68 | 63 | 55 | 51 | 41 | 30 | 14 | 0 | 0 | 0 |
| OCT 29 | 4.59 | 94 | 93 | 91 | 86 | 80 | 67 | 57 | 45 | 16 | 0 | 0 | 0 |
| NOV 5 | 2.31 | 70 | 58 | 46 | 37 | 30 | 24 | 18 | 9 | 4 | 0 | 0 | 0 |
| NOV 12 | (1.23) | 77 | 37 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOV 19 | | | | | | | | | | | | | |
| NOV 26 | (1.48) | 91 | 74 | 44 | 33 | 21 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 3 | (2.14) | 95 | 86 | 69 | 54 | 34 | 23 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 10 | 1.72 | 73 | 63 | 46 | 41 | 41 | 32 | 11 | 0 | 0 | 0 | 0 | 0 |
| DEC 17 | 1.58 | 86 | 71 | 48 | 43 | 29 | 22 | 8 | 0 | 0 | 0 | 0 | 0 |
| DEC 24 | 1.69 | 82 | 62 | 57 | 52 | 46 | 32 | 18 | 0 | 0 | 0 | 0 | 0 |

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | 2.97 | 95 | 82 | 54 | 46 | 39 | 34 | 27 | 22 | 8 | 0 | 0 | 0 |
| JAN 8 | 2.48 | 93 | 74 | 45 | 34 | 30 | 27 | 17 | 12 | 7 | 0 | 0 | 0 |
| JAN 15 | 3.54 | 93 | 76 | 71 | 65 | 55 | 49 | 41 | 34 | 22 | 0 | 0 | 0 |
| JAN 22 | (3.81) | 96 | 88 | 83 | 72 | 67 | 56 | 41 | 35 | 17 | 4 | 0 | 0 |
| JAN 29 | 3.71 | 96 | 86 | 73 | 61 | 50 | 41 | 31 | 16 | 13 | 6 | 0 | 0 |
| FEB 5 | 1.64 | 89 | 50 | 21 | 14 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FEB 12 | 4.74 | 96 | 90 | 78 | 69 | 64 | 53 | 46 | 41 | 28 | 19 | 6 | 0 |
| FEB 19 | 4.43 | 96 | 89 | 69 | 59 | 55 | 50 | 44 | 39 | 34 | 21 | 11 | 0 |
| FEB 26 | 5.03 | 97 | 92 | 82 | 70 | 59 | 55 | 46 | 37 | 28 | 14 | 3 | 0 |
| MAR 5 | 3.88 | 94 | 86 | 63 | 43 | 42 | 35 | 29 | 24 | 19 | 1 | 0 | 0 |
| MAR 12 | 4.22 | 95 | 84 | 69 | 56 | 45 | 39 | 35 | 29 | 17 | 8 | 0 | 0 |
| MAR 19 | 4.73 | 96 | 81 | 71 | 63 | 59 | 48 | 41 | 33 | 23 | 4 | 0 | 0 |
| MAR 26 | 4.17 | 91 | 72 | 66 | 62 | 53 | 43 | 38 | 29 | 18 | 7 | 0 | 0 |
| APR 2 | (4.25) | 94 | 80 | 71 | 59 | 52 | 44 | 34 | 25 | 18 | 7 | 0 | 0 |
| APR 9 | 5.14 | 89 | 79 | 73 | 71 | 68 | 65 | 60 | 55 | 37 | 13 | 5 | 0 |
| APR 16 | 3.08 | 66 | 50 | 44 | 38 | 29 | 23 | 19 | 15 | 11 | 5 | 0 | 0 |
| APR 23 | 3.30 | 84 | 62 | 51 | 44 | 33 | 26 | 20 | 14 | 11 | 5 | 0 | 0 |
| APR 30 | 3.37 | 91 | 73 | 54 | 38 | 28 | 22 | 17 | 11 | 6 | 0 | 0 | 0 |
| MAY 7 | 4.36 | 91 | 82 | 72 | 63 | 53 | 45 | 30 | 18 | 3 | 0 | 0 | 0 |
| MAY 14 | 4.13 | 87 | 71 | 58 | 55 | 49 | 41 | 30 | 22 | 9 | 1 | 0 | 0 |
| MAY 21 | 5.68 | 95 | 92 | 85 | 76 | 71 | 61 | 50 | 35 | 1 | 0 | 0 | 0 |
| MAY 28 | 3.83 | 86 | 67 | 56 | 49 | 44 | 31 | 26 | 13 | 1 | 0 | 0 | 0 |
| JUN 4 | (5.51) | 94 | 91 | 87 | 77 | 72 | 60 | 49 | 27 | 0 | 0 | 0 | 0 |
| JUN 11 | 4.46 | 92 | 81 | 68 | 62 | 52 | 45 | 35 | 21 | 3 | 0 | 0 | 0 |
| JUN 18 | 5.24 | 94 | 87 | 79 | 73 | 65 | 57 | 46 | 28 | 0 | 0 | 0 | 0 |
| JUN 25 | 5.00 | 94 | 89 | 85 | 75 | 64 | 55 | 39 | 19 | 2 | 0 | 0 | 0 |
| JUL 2 | 4.58 | 82 | 76 | 71 | 64 | 55 | 45 | 35 | 21 | 8 | 0 | 0 | 0 |
| JUL 9 | 5.67 | 95 | 91 | 86 | 80 | 75 | 66 | 49 | 33 | 4 | 1 | 0 | 0 |
| JUL 16 | (5.21) | 93 | 78 | 73 | 68 | 64 | 54 | 46 | 31 | 5 | 0 | 0 | 0 |
| JUL 23 | 4.70 | 92 | 82 | 74 | 65 | 57 | 48 | 37 | 23 | 0 | 0 | 0 | 0 |
| JUL 30 | 5.52 | 96 | 91 | 83 | 76 | 68 | 59 | 50 | 35 | 15 | 2 | 0 | 0 |
| AUG 6 | 5.79 | 96 | 93 | 89 | 81 | 73 | 65 | 55 | 38 | 8 | 0 | 0 | 0 |
| AUG 13 | 4.35 | 94 | 85 | 74 | 62 | 57 | 46 | 33 | 15 | 6 | 2 | 0 | 0 |
| AUG 20 | (5.07) | 96 | 89 | 84 | 75 | 65 | 52 | 38 | 30 | 4 | 0 | 0 | 0 |
| AUG 27 | 5.07 | 91 | 83 | 76 | 71 | 64 | 58 | 48 | 30 | 12 | 0 | 0 | 0 |
| SEP 3 | (5.24) | 95 | 89 | 82 | 78 | 68 | 57 | 52 | 37 | 14 | 0 | 0 | 0 |
| SEP 10 | 3.51 | 66 | 54 | 48 | 44 | 39 | 36 | 32 | 26 | 19 | 6 | 1 | 0 |
| SEP 17 | 5.17 | 83 | 80 | 75 | 69 | 64 | 55 | 47 | 39 | 27 | 13 | 2 | 0 |
| SEP 24 | 6.08 | 98 | 96 | 92 | 88 | 79 | 73 | 62 | 50 | 35 | 4 | 0 | 0 |
| OCT 1 | 5.14 | 86 | 82 | 77 | 73 | 65 | 58 | 48 | 37 | 21 | 9 | 0 | 0 |
| OCT 8 | (6.18) | 98 | 97 | 94 | 89 | 81 | 73 | 65 | 55 | 40 | 11 | 0 | 0 |
| OCT 15 | 4.30 | 88 | 81 | 73 | 67 | 59 | 44 | 33 | 28 | 21 | 11 | 0 | 0 |
| OCT 22 | 4.79 | 97 | 94 | 83 | 79 | 72 | 65 | 49 | 42 | 28 | 14 | 2 | 0 |
| OCT 29 | 4.67 | 90 | 81 | 77 | 76 | 69 | 60 | 55 | 40 | 28 | 18 | 0 | 0 |
| NOV 5 | 2.34 | 90 | 68 | 55 | 41 | 31 | 24 | 20 | 13 | 6 | 0 | 0 | 0 |
| NOV 12 | 3.27 | 84 | 61 | 57 | 52 | 44 | 36 | 32 | 27 | 15 | 8 | 0 | 0 |
| NOV 19 | 3.09 | 88 | 69 | 56 | 53 | 48 | 43 | 38 | 34 | 25 | 16 | 2 | 2 |
| NOV 26 | (1.38) | 82 | 43 | 37 | 37 | 30 | 27 | 13 | 5 | 5 | 0 | 0 | 0 |
| DEC 3 | (2.88) | 94 | 80 | 63 | 55 | 45 | 34 | 26 | 11 | 2 | 0 | 0 | 0 |
| DEC 10 | 3.82 | 92 | 79 | 77 | 72 | 64 | 60 | 50 | 42 | 24 | 7 | 0 | 0 |
| DEC 17 | 2.18 | 91 | 65 | 52 | 48 | 44 | 39 | 34 | 19 | 4 | 0 | 0 | 0 |
| DEC 24 | 2.69 | 90 | 60 | 50 | 44 | 42 | 36 | 26 | 19 | 14 | 4 | 0 | 0 |

SOLAR RADIATION DATA for: GLENDIVE,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 2.76 | 92 | 78 | 64 | 55 | 47 | 35 | 26 | 23 | 8 | 0 | 0 | 0 |
| JAN 8 | 2.69 | 91 | 71 | 53 | 46 | 42 | 36 | 30 | 21 | 10 | 0 | 0 | 0 |
| JAN 15 | 3.73 | 95 | 84 | 73 | 61 | 55 | 45 | 41 | 33 | 21 | 0 | 0 | 0 |
| JAN 22 | (3.07) | 90 | 59 | 53 | 44 | 43 | 43 | 37 | 22 | 12 | 0 | 0 | 0 |
| JAN 29 | 3.09 | 94 | 80 | 60 | 41 | 36 | 33 | 30 | 21 | 9 | 0 | 0 | 0 |
| FEB 5 | 1.23 | 82 | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FEB 12 | 3.95 | 95 | 86 | 76 | 64 | 54 | 47 | 36 | 30 | 16 | 3 | 0 | 0 |
| FEB 19 | 4.08 | 96 | 88 | 75 | 66 | 58 | 53 | 45 | 39 | 29 | 12 | 0 | 0 |
| FEB 26 | 4.96 | 94 | 83 | 68 | 63 | 62 | 58 | 51 | 44 | 34 | 17 | 0 | 0 |
| MAR 5 | 3.46 | 93 | 76 | 62 | 54 | 43 | 35 | 20 | 15 | 11 | 1 | 0 | 0 |
| MAR 12 | 3.02 | 91 | 73 | 44 | 39 | 32 | 26 | 14 | 8 | 6 | 6 | 1 | 0 |
| MAR 19 | 4.78 | 94 | 82 | 78 | 68 | 59 | 53 | 43 | 28 | 16 | 1 | 0 | 0 |
| MAR 26 | (3.75) | 78 | 61 | 52 | 50 | 46 | 44 | 35 | 21 | 10 | 0 | 0 | 0 |
| APR 2 | 4.53 | 95 | 89 | 82 | 71 | 63 | 54 | 38 | 28 | 17 | 0 | 0 | 0 |
| APR 9 | 4.40 | 88 | 69 | 61 | 55 | 50 | 45 | 41 | 33 | 26 | 3 | 0 | 0 |
| APR 16 | 2.69 | 69 | 51 | 40 | 28 | 25 | 21 | 17 | 12 | 4 | 0 | 0 | 0 |
| APR 23 | 3.29 | 82 | 70 | 60 | 53 | 41 | 27 | 19 | 9 | 3 | 0 | 0 | 0 |
| APR 30 | 2.99 | 88 | 64 | 41 | 30 | 23 | 19 | 12 | 7 | 0 | 0 | 0 | 0 |
| MAY 7 | 3.38 | 84 | 66 | 54 | 46 | 35 | 30 | 26 | 15 | 2 | 0 | 0 | 0 |
| MAY 14 | 3.09 | 74 | 55 | 47 | 40 | 32 | 22 | 17 | 11 | 3 | 0 | 0 | 0 |
| MAY 21 | 5.24 | 95 | 91 | 86 | 80 | 72 | 60 | 36 | 19 | 0 | 0 | 0 | 0 |
| MAY 28 | (2.38) | 69 | 48 | 36 | 30 | 21 | 16 | 8 | 3 | 0 | 0 | 0 | 0 |
| JUN 4 | (4.69) | 94 | 88 | 76 | 67 | 54 | 44 | 28 | 12 | 0 | 0 | 0 | 0 |
| JUN 11 | (5.40) | 96 | 90 | 85 | 80 | 71 | 61 | 48 | 23 | 6 | 0 | 0 | 0 |
| JUN 18 | 4.60 | 90 | 79 | 70 | 62 | 54 | 47 | 38 | 13 | 0 | 0 | 0 | 0 |
| JUN 25 | (4.48) | 95 | 91 | 84 | 74 | 66 | 59 | 43 | 21 | 0 | 0 | 0 | 0 |
| JUL 2 | (4.25) | 92 | 79 | 64 | 58 | 49 | 41 | 30 | 9 | 1 | 0 | 0 | 0 |
| JUL 9 | 5.43 | 96 | 93 | 88 | 80 | 73 | 60 | 45 | 16 | 0 | 0 | 0 | 0 |
| JUL 16 | 3.93 | 89 | 77 | 68 | 58 | 46 | 34 | 27 | 18 | 2 | 0 | 0 | 0 |
| JUL 23 | 5.09 | 96 | 91 | 86 | 78 | 69 | 58 | 39 | 18 | 0 | 0 | 0 | 0 |
| JUL 30 | 6.00 | 97 | 94 | 91 | 85 | 78 | 67 | 56 | 36 | 10 | 0 | 0 | 0 |
| AUG 6 | (5.94) | 97 | 95 | 91 | 85 | 81 | 72 | 55 | 36 | 0 | 0 | 0 | 0 |
| AUG 13 | | | | | | | | | | | | | |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | (6.49) | 99 | 97 | 93 | 87 | 82 | 75 | 65 | 50 | 29 | 15 | 0 | 0 |
| SEP 3 | 5.85 | 98 | 95 | 92 | 85 | 75 | 65 | 51 | 33 | 15 | 0 | 0 | 0 |
| SEP 10 | (4.11) | 85 | 72 | 59 | 55 | 52 | 42 | 31 | 19 | 9 | 1 | 0 | 0 |
| SEP 17 | (5.86) | 98 | 97 | 94 | 90 | 87 | 80 | 65 | 50 | 27 | 0 | 0 | 0 |
| SEP 24 | 5.72 | 98 | 95 | 92 | 87 | 83 | 76 | 65 | 48 | 31 | 1 | 0 | 0 |
| OCT 1 | 4.44 | 86 | 79 | 76 | 73 | 69 | 64 | 53 | 39 | 22 | 0 | 0 | 0 |
| OCT 8 | 3.90 | 96 | 89 | 80 | 69 | 58 | 48 | 36 | 24 | 10 | 0 | 0 | 0 |
| OCT 15 | 4.16 | 97 | 83 | 73 | 67 | 58 | 50 | 36 | 26 | 14 | 0 | 0 | 0 |
| OCT 22 | 3.72 | 86 | 78 | 75 | 69 | 61 | 53 | 44 | 21 | 7 | 0 | 0 | 0 |
| OCT 29 | 3.95 | 90 | 79 | 75 | 73 | 66 | 59 | 49 | 27 | 12 | 0 | 0 | 0 |
| NOV 5 | 2.31 | 78 | 60 | 47 | 45 | 30 | 23 | 13 | 10 | 8 | 0 | 0 | 0 |
| NOV 12 | (2.35) | 74 | 44 | 40 | 35 | 31 | 29 | 24 | 17 | 6 | 0 | 0 | 0 |
| NOV 19 | (2.30) | 92 | 58 | 51 | 45 | 37 | 31 | 28 | 14 | 0 | 0 | 0 | 0 |
| NOV 26 | | | | | | | | | | | | | |
| DEC 3 | | | | | | | | | | | | | |
| DEC 10 | | | | | | | | | | | | | |
| DEC 17 | | | | | | | | | | | | | |
| DEC 24 | | | | | | | | | | | | | |

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 3.65 | 96 | 78 | 72 | 67 | 64 | 57 | 45 | 33 | 15 | 2 | 0 | 0 |
| JAN 8 | 2.50 | 87 | 54 | 51 | 48 | 41 | 37 | 28 | 19 | 9 | 2 | 0 | 0 |
| JAN 15 | (3.76) | 89 | 81 | 71 | 70 | 65 | 60 | 52 | 39 | 20 | 1 | 0 | 0 |
| JAN 22 | (2.39) | 89 | 61 | 42 | 33 | 31 | 27 | 24 | 21 | 17 | 8 | 0 | 0 |
| JAN 29 | (3.52) | 97 | 89 | 82 | 71 | 62 | 54 | 49 | 42 | 35 | 15 | 2 | 0 |
| FEB 5 | 2.25 | 84 | 63 | 44 | 33 | 26 | 22 | 18 | 15 | 10 | 4 | 0 | 0 |
| FEB 12 | (4.64) | 98 | 93 | 88 | 81 | 69 | 57 | 51 | 43 | 35 | 16 | 3 | 0 |
| FEB 19 | 4.54 | 96 | 88 | 77 | 72 | 67 | 58 | 51 | 43 | 35 | 22 | 5 | 2 |
| FEB 26 | 5.49 | 98 | 95 | 89 | 83 | 75 | 72 | 62 | 51 | 41 | 25 | 5 | 0 |
| MAR 5 | 4.55 | 97 | 90 | 77 | 64 | 55 | 48 | 41 | 34 | 25 | 13 | 2 | 0 |
| MAR 12 | 3.40 | 91 | 71 | 57 | 48 | 45 | 38 | 32 | 26 | 16 | 9 | 2 | 1 |
| MAR 19 | 4.02 | 86 | 64 | 60 | 56 | 51 | 45 | 39 | 30 | 20 | 10 | 0 | 0 |
| MAR 26 | 3.29 | 89 | 67 | 50 | 43 | 38 | 31 | 25 | 20 | 14 | 0 | 0 | 0 |
| APR 2 | 4.81 | 96 | 81 | 72 | 63 | 57 | 51 | 45 | 38 | 32 | 16 | 5 | 1 |
| APR 9 | 5.12 | 96 | 87 | 78 | 70 | 64 | 57 | 48 | 39 | 26 | 9 | 3 | 0 |
| APR 16 | 3.46 | 90 | 64 | 48 | 40 | 37 | 31 | 26 | 21 | 13 | 5 | 1 | 0 |
| APR 23 | 3.86 | 96 | 82 | 68 | 52 | 40 | 33 | 24 | 18 | 12 | 1 | 0 | 0 |
| APR 30 | 3.43 | 92 | 74 | 59 | 47 | 41 | 35 | 31 | 21 | 16 | 7 | 2 | 0 |
| MAY 7 | 4.36 | 94 | 83 | 69 | 62 | 54 | 48 | 39 | 28 | 18 | 6 | 1 | 0 |
| MAY 14 | 4.05 | 85 | 68 | 58 | 53 | 48 | 42 | 34 | 25 | 10 | 1 | 0 | 0 |
| MAY 21 | 4.90 | 94 | 86 | 75 | 69 | 65 | 58 | 50 | 37 | 14 | 1 | 0 | 0 |
| MAY 28 | 4.23 | 84 | 75 | 66 | 56 | 49 | 42 | 35 | 26 | 11 | 2 | 0 | 0 |
| JUN 4 | 5.46 | 95 | 90 | 85 | 79 | 71 | 61 | 48 | 31 | 4 | 0 | 0 | 0 |
| JUN 11 | 4.77 | 93 | 85 | 79 | 71 | 63 | 55 | 43 | 26 | 10 | 1 | 0 | 0 |
| JUN 18 | 4.96 | 93 | 86 | 79 | 71 | 64 | 57 | 47 | 29 | 5 | 1 | 0 | 0 |
| JUN 25 | 4.65 | 91 | 84 | 77 | 69 | 61 | 54 | 43 | 26 | 1 | 0 | 0 | 0 |
| JUL 2 | 3.02 | 76 | 60 | 47 | 37 | 32 | 26 | 21 | 12 | 2 | 0 | 0 | 0 |
| JUL 9 | 5.69 | 96 | 92 | 88 | 84 | 78 | 70 | 56 | 39 | 5 | 0 | 0 | 0 |
| JUL 16 | 4.39 | 91 | 76 | 68 | 63 | 58 | 51 | 42 | 31 | 13 | 1 | 0 | 0 |
| JUL 23 | 5.84 | 97 | 93 | 89 | 83 | 76 | 67 | 54 | 36 | 4 | 0 | 0 | 0 |
| JUL 30 | (5.43) | 97 | 91 | 86 | 80 | 75 | 65 | 53 | 34 | 7 | 0 | 0 | 0 |
| AUG 6 | (5.85) | 96 | 93 | 88 | 83 | 80 | 71 | 56 | 34 | 2 | 0 | 0 | 0 |
| AUG 13 | 3.95 | 82 | 68 | 58 | 48 | 45 | 37 | 32 | 22 | 13 | 1 | 0 | 0 |
| AUG 20 | 5.57 | 96 | 94 | 88 | 82 | 72 | 60 | 50 | 36 | 15 | 0 | 0 | 0 |
| AUG 27 | 6.06 | 98 | 94 | 91 | 85 | 80 | 72 | 59 | 50 | 25 | 1 | 0 | 0 |
| SEP 3 | 4.73 | 93 | 88 | 82 | 74 | 64 | 56 | 48 | 35 | 19 | 2 | 0 | 0 |
| SEP 10 | 3.58 | 72 | 60 | 52 | 50 | 42 | 37 | 33 | 28 | 21 | 5 | 0 | 0 |
| SEP 17 | 4.64 | 91 | 74 | 67 | 63 | 58 | 50 | 41 | 35 | 22 | 4 | 0 | 0 |
| SEP 24 | 4.68 | 96 | 88 | 80 | 74 | 65 | 53 | 42 | 28 | 16 | 0 | 0 | 0 |
| OCT 1 | 5.02 | 97 | 92 | 84 | 78 | 71 | 64 | 51 | 46 | 30 | 9 | 2 | 0 |
| OCT 8 | 5.04 | 98 | 94 | 84 | 78 | 71 | 66 | 55 | 38 | 24 | 0 | 0 | 0 |
| OCT 15 | 4.04 | 80 | 75 | 68 | 59 | 52 | 47 | 42 | 35 | 23 | 1 | 0 | 0 |
| OCT 22 | 3.68 | 87 | 78 | 69 | 56 | 51 | 46 | 39 | 29 | 19 | 0 | 0 | 0 |
| OCT 29 | 4.57 | 92 | 87 | 79 | 77 | 72 | 66 | 54 | 41 | 24 | 0 | 0 | 0 |
| NOV 5 | 1.95 | 73 | 55 | 43 | 29 | 21 | 15 | 12 | 9 | 5 | 0 | 0 | 0 |
| NOV 12 | (3.37) | 78 | 61 | 56 | 53 | 49 | 46 | 41 | 35 | 20 | 0 | 0 | 0 |
| NOV 19 | 3.74 | 96 | 81 | 76 | 70 | 63 | 57 | 49 | 29 | 10 | 0 | 0 | 0 |
| NOV 26 | (2.02) | 73 | 50 | 34 | 28 | 26 | 25 | 22 | 18 | 4 | 0 | 0 | 0 |
| DEC 3 | 2.37 | 82 | 68 | 53 | 45 | 34 | 30 | 27 | 21 | 13 | 0 | 0 | 0 |
| DEC 10 | 3.09 | 79 | 68 | 65 | 62 | 56 | 51 | 42 | 32 | 17 | 0 | 0 | 0 |
| DEC 17 | 2.67 | 92 | 75 | 62 | 58 | 50 | 43 | 39 | 26 | 9 | 0 | 0 | 0 |
| DEC 24 | (2.53) | 93 | 71 | 64 | 60 | 47 | 44 | 25 | 17 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HAMILTON,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 1.96 | 82 | 49 | 33 | 28 | 23 | 20 | 17 | 14 | 2 | 0 | 0 | 0 |
| JAN 8 | .81 | 43 | 17 | 10 | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAN 15 | ( .81) | 59 | 13 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAN 22 | (2.09) | 81 | 43 | 41 | 31 | 26 | 21 | 17 | 10 | 4 | 4 | 0 | 0 |
| JAN 29 | 2.52 | 90 | 63 | 56 | 50 | 38 | 30 | 19 | 14 | 6 | 1 | 0 | 0 |
| FEB 5 | 2.27 | 76 | 58 | 48 | 40 | 37 | 24 | 18 | 15 | 9 | 2 | 0 | 0 |
| FEB 12 | 3.59 | 93 | 64 | 56 | 53 | 47 | 43 | 38 | 32 | 19 | 2 | 0 | 0 |
| FEB 19 | (3.61) | 92 | 70 | 60 | 53 | 50 | 48 | 43 | 34 | 23 | 8 | 3 | 0 |
| FEB 26 | 3.88 | 95 | 86 | 79 | 69 | 58 | 53 | 43 | 34 | 20 | 11 | 5 | 0 |
| MAR 5 | 3.44 | 92 | 74 | 58 | 52 | 42 | 36 | 27 | 21 | 14 | 6 | 0 | 0 |
| MAR 12 | 4.42 | 97 | 87 | 76 | 64 | 54 | 45 | 32 | 25 | 14 | 0 | 0 | 0 |
| MAR 19 | (4.77) | 97 | 91 | 83 | 74 | 68 | 56 | 50 | 37 | 15 | 3 | 0 | 0 |
| MAR 26 | (5.05) | 96 | 92 | 85 | 80 | 71 | 59 | 47 | 37 | 18 | 0 | 0 | 0 |
| APR 2 | (3.99) | 94 | 87 | 77 | 67 | 56 | 44 | 32 | 24 | 15 | 5 | 0 | 0 |
| APR 9 | 5.35 | 97 | 92 | 84 | 78 | 68 | 59 | 46 | 33 | 18 | 2 | 0 | 0 |
| APR 16 | 3.73 | 92 | 84 | 73 | 46 | 39 | 33 | 24 | 17 | 8 | 0 | 0 | 0 |
| APR 23 | 3.50 | 90 | 77 | 65 | 49 | 36 | 25 | 18 | 4 | 2 | 2 | 0 | 0 |
| APR 30 | 2.79 | 90 | 62 | 41 | 32 | 25 | 22 | 14 | 5 | 2 | 2 | 0 | 0 |
| MAY 7 | 3.75 | 95 | 82 | 70 | 56 | 46 | 33 | 21 | 9 | 6 | 0 | 0 | 0 |
| MAY 14 | 2.91 | 80 | 55 | 42 | 37 | 27 | 23 | 13 | 7 | 0 | 0 | 0 | 0 |
| MAY 21 | | | | | | | | | | | | | |
| MAY 28 | | | | | | | | | | | | | |
| JUN 4 | | | | | | | | | | | | | |
| JUN 11 | | | | | | | | | | | | | |
| JUN 18 | | | | | | | | | | | | | |
| JUN 25 | | | | | | | | | | | | | |
| JUL 2 | | | | | | | | | | | | | |
| JUL 9 | | | | | | | | | | | | | |
| JUL 16 | | | | | | | | | | | | | |
| JUL 23 | | | | | | | | | | | | | |
| JUL 30 | | | | | | | | | | | | | |
| AUG 6 | | | | | | | | | | | | | |
| AUG 13 | | | | | | | | | | | | | |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | 4.72 | 89 | 83 | 75 | 68 | 58 | 51 | 39 | 25 | 5 | 0 | 0 | 0 |
| SEP 3 | 3.99 | 95 | 84 | 77 | 66 | 60 | 48 | 34 | 15 | 6 | 0 | 0 | 0 |
| SEP 10 | (1.09) | 64 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SEP 17 | | | | | | | | | | | | | |
| SEP 24 | | | | | | | | | | | | | |
| OCT 1 | (5.44) | 99 | 96 | 92 | 85 | 76 | 61 | 55 | 48 | 0 | 0 | 0 | 0 |
| OCT 8 | 5.91 | 99 | 96 | 92 | 86 | 80 | 72 | 63 | 51 | 28 | 9 | 0 | 0 |
| OCT 15 | 5.04 | 93 | 85 | 77 | 74 | 64 | 60 | 52 | 41 | 28 | 3 | 0 | 0 |
| OCT 22 | 4.59 | 90 | 82 | 78 | 70 | 65 | 58 | 47 | 36 | 15 | 0 | 0 | 0 |
| OCT 29 | 4.02 | 93 | 81 | 76 | 71 | 64 | 62 | 50 | 43 | 15 | 1 | 0 | 0 |
| NOV 5 | 3.06 | 82 | 75 | 68 | 60 | 53 | 41 | 22 | 12 | 4 | 0 | 0 | 0 |
| NOV 12 | 1.90 | 67 | 28 | 27 | 25 | 23 | 21 | 17 | 14 | 0 | 0 | 0 | 0 |
| NOV 19 | 1.42 | 51 | 31 | 29 | 22 | 19 | 9 | 3 | 3 | 0 | 0 | 0 | 0 |
| NOV 26 | (1.38) | 66 | 42 | 38 | 22 | 18 | 15 | 9 | 3 | 0 | 0 | 0 | 0 |
| DEC 3 | (2.44) | 86 | 67 | 49 | 46 | 42 | 35 | 31 | 22 | 5 | 0 | 0 | 0 |
| DEC 10 | 2.57 | 76 | 67 | 62 | 51 | 45 | 35 | 26 | 15 | 2 | 0 | 0 | 0 |
| DEC 17 | ( .88) | 68 | 18 | 11 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 24 | 2.60 | 83 | 68 | 59 | 44 | 40 | 37 | 30 | 20 | 5 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HARLOWTON,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 3.24 | 92 | 81 | 62 | 57 | 49 | 40 | 35 | 26 | 17 | 2 | 0 | 0 |
| JAN 8 | (2.74) | 86 | 49 | 46 | 45 | 43 | 36 | 25 | 18 | 11 | 0 | 0 | 0 |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | (4.29) | 96 | 89 | 79 | 67 | 60 | 57 | 48 | 36 | 22 | 4 | 0 | 0 |
| FEB 5 | 2.18 | 90 | 51 | 29 | 18 | 18 | 14 | 11 | 9 | 7 | 0 | 0 | 0 |
| FEB 12 | 4.45 | 96 | 90 | 79 | 71 | 62 | 50 | 43 | 31 | 19 | 11 | 0 | 0 |
| FEB 19 | 3.72 | 96 | 85 | 75 | 63 | 54 | 39 | 34 | 23 | 16 | 7 | 0 | 0 |
| FEB 26 | 5.26 | 97 | 90 | 82 | 77 | 68 | 62 | 49 | 40 | 31 | 15 | 0 | 0 |
| MAR 5 | 4.79 | 95 | 84 | 79 | 67 | 60 | 55 | 43 | 34 | 21 | 6 | 0 | 0 |
| MAR 12 | 4.40 | 95 | 89 | 78 | 67 | 55 | 49 | 38 | 29 | 18 | 5 | 0 | 0 |
| MAR 19 | 4.52 | 86 | 69 | 65 | 59 | 55 | 48 | 37 | 27 | 18 | 3 | 0 | 0 |
| MAR 26 | 5.32 | 95 | 89 | 84 | 75 | 69 | 62 | 56 | 43 | 31 | 11 | 0 | 0 |
| APR 2 | 4.55 | 94 | 79 | 70 | 59 | 52 | 44 | 36 | 25 | 19 | 7 | 0 | 0 |
| APR 9 | 4.44 | 91 | 83 | 67 | 53 | 47 | 40 | 32 | 27 | 20 | 11 | 2 | 0 |
| APR 16 | 3.52 | 88 | 70 | 58 | 47 | 39 | 25 | 23 | 16 | 10 | 5 | 1 | 0 |
| APR 23 | 3.94 | 80 | 66 | 60 | 54 | 47 | 44 | 40 | 28 | 14 | 0 | 0 | 0 |
| APR 30 | 2.97 | 84 | 60 | 46 | 36 | 24 | 20 | 14 | 9 | 4 | 0 | 0 | 0 |
| MAY 7 | 3.98 | 94 | 84 | 67 | 52 | 43 | 32 | 26 | 19 | 14 | 3 | 0 | 0 |
| MAY 14 | 3.77 | 84 | 63 | 55 | 50 | 44 | 38 | 28 | 19 | 4 | 0 | 0 | 0 |
| MAY 21 | (5.84) | 95 | 93 | 89 | 86 | 82 | 72 | 60 | 54 | 32 | 0 | 0 | 0 |
| MAY 28 | | | | | | | | | | | | | |
| JUN 4 | | | | | | | | | | | | | |
| JUN 11 | (5.84) | 95 | 90 | 88 | 85 | 76 | 66 | 55 | 36 | 0 | 0 | 0 | 0 |
| JUN 18 | 4.45 | 94 | 86 | 77 | 67 | 58 | 48 | 36 | 21 | 2 | 0 | 0 | 0 |
| JUN 25 | 4.37 | 82 | 77 | 72 | 68 | 62 | 54 | 42 | 20 | 0 | 0 | 0 | 0 |
| JUL 2 | 3.22 | 87 | 67 | 54 | 43 | 34 | 24 | 19 | 9 | 0 | 0 | 0 | 0 |
| JUL 9 | 4.98 | 95 | 92 | 87 | 79 | 71 | 59 | 48 | 24 | 0 | 0 | 0 | 0 |
| JUL 16 | 4.06 | 75 | 65 | 55 | 47 | 40 | 34 | 29 | 22 | 2 | 0 | 0 | 0 |
| JUL 23 | 5.33 | 96 | 91 | 86 | 81 | 72 | 64 | 52 | 28 | 0 | 0 | 0 | 0 |
| JUL 30 | 4.96 | 95 | 88 | 80 | 74 | 67 | 56 | 45 | 24 | 1 | 0 | 0 | 0 |
| AUG 6 | 5.44 | 96 | 91 | 87 | 82 | 76 | 67 | 53 | 30 | 0 | 0 | 0 | 0 |
| AUG 13 | (4.15) | 94 | 84 | 71 | 56 | 42 | 33 | 27 | 19 | 11 | 0 | 0 | 0 |
| AUG 20 | 5.91 | 97 | 93 | 89 | 82 | 79 | 73 | 61 | 47 | 17 | 0 | 0 | 0 |
| AUG 27 | 5.09 | 96 | 89 | 82 | 76 | 66 | 58 | 48 | 33 | 22 | 5 | 0 | 0 |
| SEP 3 | 4.92 | 96 | 87 | 83 | 74 | 65 | 57 | 47 | 35 | 16 | 4 | 0 | 0 |
| SEP 10 | 3.51 | 77 | 58 | 55 | 44 | 38 | 36 | 30 | 27 | 21 | 1 | 0 | 0 |
| SEP 17 | 4.58 | 82 | 76 | 72 | 67 | 60 | 52 | 46 | 36 | 27 | 6 | 0 | 0 |
| SEP 24 | (6.52) | 98 | 96 | 92 | 88 | 86 | 78 | 68 | 56 | 37 | 2 | 0 | 0 |
| OCT 1 | | | | | | | | | | | | | |
| OCT 8 | | | | | | | | | | | | | |
| OCT 15 | | | | | | | | | | | | | |
| OCT 22 | | | | | | | | | | | | | |
| OCT 29 | | | | | | | | | | | | | |
| NOV 5 | | | | | | | | | | | | | |
| NOV 12 | | | | | | | | | | | | | |
| NOV 19 | | | | | | | | | | | | | |
| NOV 26 | | | | | | | | | | | | | |
| DEC 3 | | | | | | | | | | | | | |
| DEC 10 | | | | | | | | | | | | | |
| DEC 17 | | | | | | | | | | | | | |
| DEC 24 | | | | | | | | | | | | | |

# SOLAR RADIATION DATA for: HAVRE, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | (2.27) | 94 | 94 | 83 | 32 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAN 15 | 3.28 | 93 | 69 | 57 | 53 | 46 | 41 | 34 | 27 | 17 | 0 | 0 | 0 |
| JAN 22 | 2.17 | 88 | 59 | 54 | 43 | 33 | 26 | 16 | 10 | 4 | 2 | 0 | 0 |
| JAN 29 | 3.39 | 94 | 83 | 64 | 56 | 49 | 46 | 40 | 24 | 14 | 3 | 0 | 0 |
| FEB 5 | 1.96 | 90 | 60 | 31 | 19 | 13 | 12 | 5 | 4 | 4 | 0 | 0 | 0 |
| FEB 12 | 4.42 | 96 | 91 | 81 | 73 | 61 | 46 | 43 | 33 | 21 | 9 | 0 | 0 |
| FEB 19 | 4.40 | 95 | 81 | 75 | 70 | 64 | 54 | 46 | 37 | 25 | 1 | 0 | 0 |
| FEB 26 | 5.70 | 98 | 96 | 92 | 86 | 73 | 64 | 54 | 46 | 30 | 12 | 0 | 0 |
| MAR 5 | 4.39 | 97 | 91 | 83 | 69 | 53 | 42 | 27 | 18 | 7 | 1 | 0 | 0 |
| MAR 12 | 3.12 | 92 | 77 | 58 | 41 | 35 | 23 | 14 | 12 | 7 | 0 | 0 | 0 |
| MAR 19 | 4.54 | 95 | 81 | 75 | 67 | 60 | 49 | 43 | 24 | 13 | 0 | 0 | 0 |
| MAR 26 | 3.62 | 88 | 76 | 66 | 61 | 50 | 39 | 19 | 11 | 7 | 0 | 0 | 0 |
| APR 2 | 4.29 | 89 | 77 | 71 | 65 | 57 | 53 | 44 | 34 | 14 | 2 | 0 | 0 |
| APR 9 | 4.16 | 94 | 82 | 69 | 57 | 49 | 37 | 33 | 20 | 12 | 3 | 0 | 0 |
| APR 16 | 3.08 | 70 | 50 | 44 | 41 | 38 | 32 | 25 | 14 | 7 | 1 | 0 | 0 |
| APR 23 | 2.61 | 71 | 45 | 31 | 26 | 25 | 19 | 14 | 10 | 7 | 0 | 0 | 0 |
| APR 30 | 3.03 | 79 | 58 | 49 | 40 | 32 | 27 | 23 | 16 | 12 | 0 | 0 | 0 |
| MAY 7 | 4.37 | 92 | 83 | 76 | 67 | 61 | 48 | 35 | 16 | 7 | 2 | 0 | 0 |
| MAY 14 | (4.59) | 93 | 89 | 77 | 69 | 57 | 43 | 37 | 30 | 10 | 0 | 0 | 0 |
| MAY 21 | (5.18) | 93 | 92 | 85 | 76 | 71 | 63 | 50 | 40 | 4 | 0 | 0 | 0 |
| MAY 28 | 3.65 | 79 | 73 | 61 | 50 | 43 | 38 | 29 | 15 | 1 | 0 | 0 | 0 |
| JUN 4 | 4.63 | 92 | 86 | 81 | 67 | 54 | 40 | 30 | 12 | 0 | 0 | 0 | 0 |
| JUN 11 | 4.70 | 92 | 87 | 83 | 75 | 69 | 56 | 40 | 25 | 3 | 0 | 0 | 0 |
| JUN 18 | 4.82 | 91 | 80 | 77 | 73 | 66 | 56 | 43 | 22 | 2 | 0 | 0 | 0 |
| JUN 25 | 4.80 | 92 | 88 | 82 | 78 | 71 | 59 | 45 | 23 | 0 | 0 | 0 | 0 |
| JUL 2 | 3.29 | 83 | 72 | 59 | 48 | 35 | 28 | 19 | 13 | 0 | 0 | 0 | 0 |
| JUL 9 | 5.48 | 95 | 93 | 89 | 87 | 78 | 68 | 53 | 33 | 4 | 0 | 0 | 0 |
| JUL 16 | 4.32 | 89 | 83 | 74 | 68 | 60 | 50 | 37 | 22 | 5 | 0 | 0 | 0 |
| JUL 23 | | | | | | | | | | | | | |
| JUL 30 | | | | | | | | | | | | | |
| AUG 6 | | | | | | | | | | | | | |
| AUG 13 | | | | | | | | | | | | | |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | (5.58) | 95 | 90 | 85 | 82 | 79 | 73 | 64 | 56 | 35 | 0 | 0 | 0 |
| SEP 3 | 4.55 | 94 | 87 | 80 | 73 | 66 | 57 | 43 | 34 | 16 | 2 | 0 | 0 |
| SEP 10 | 3.28 | 63 | 58 | 51 | 46 | 42 | 37 | 30 | 24 | 18 | 7 | 0 | 0 |
| SEP 17 | 4.80 | 88 | 79 | 72 | 62 | 56 | 51 | 46 | 38 | 29 | 11 | 0 | 0 |
| SEP 24 | 5.08 | 97 | 90 | 83 | 77 | 66 | 51 | 39 | 28 | 18 | 1 | 0 | 0 |
| OCT 1 | 5.10 | 98 | 94 | 87 | 78 | 69 | 64 | 52 | 40 | 24 | 6 | 5 | 0 |
| OCT 8 | 5.31 | 98 | 94 | 90 | 82 | 74 | 65 | 54 | 42 | 18 | 0 | 0 | 0 |
| OCT 15 | 4.24 | 77 | 67 | 65 | 62 | 59 | 53 | 48 | 42 | 25 | 0 | 0 | 0 |
| OCT 22 | 3.58 | 80 | 65 | 59 | 55 | 53 | 40 | 37 | 30 | 18 | 6 | 2 | 0 |
| OCT 29 | 4.38 | 95 | 88 | 84 | 76 | 63 | 55 | 47 | 34 | 21 | 1 | 0 | 0 |
| NOV 5 | 1.96 | 81 | 51 | 46 | 40 | 33 | 22 | 11 | 0 | 0 | 0 | 0 | 0 |
| NOV 12 | 2.78 | 84 | 54 | 48 | 42 | 37 | 33 | 32 | 29 | 18 | 0 | 0 | 0 |
| NOV 19 | 3.58 | 95 | 78 | 68 | 60 | 54 | 44 | 38 | 27 | 14 | 3 | 0 | 0 |
| NOV 26 | 2.44 | 81 | 65 | 57 | 51 | 42 | 40 | 19 | 11 | 2 | 0 | 0 | 0 |
| DEC 3 | 2.41 | 90 | 73 | 64 | 57 | 43 | 31 | 20 | 8 | 0 | 0 | 0 | 0 |
| DEC 10 | 1.97 | 74 | 55 | 48 | 40 | 36 | 30 | 21 | 13 | 5 | 0 | 0 | 0 |
| DEC 17 | 1.73 | 62 | 43 | 39 | 36 | 27 | 22 | 18 | 14 | 1 | 0 | 0 | 0 |
| DEC 24 | 1.80 | 79 | 50 | 42 | 33 | 24 | 17 | 11 | 2 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HELENA,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 3.14 | 91 | 71 | 56 | 54 | 48 | 39 | 36 | 26 | 18 | 4 | 0 | 0 |
| JAN 8 | 1.77 | 81 | 50 | 32 | 29 | 26 | 18 | 9 | 9 | 2 | 0 | 0 | 0 |
| JAN 15 | (3.56) | 95 | 86 | 73 | 57 | 53 | 49 | 42 | 32 | 18 | 10 | 2 | 0 |
| JAN 22 | 2.16 | 80 | 50 | 31 | 28 | 26 | 23 | 17 | 10 | 7 | 6 | 2 | 0 |
| JAN 29 | 3.10 | 94 | 80 | 61 | 53 | 39 | 29 | 25 | 19 | 9 | 7 | 0 | 0 |
| FEB 5 | 2.37 | 88 | 66 | 43 | 31 | 28 | 23 | 16 | 13 | 9 | 6 | 0 | 0 |
| FEB 12 | (4.07) | 96 | 90 | 79 | 72 | 59 | 49 | 42 | 33 | 18 | 9 | 0 | 0 |
| FEB 19 | 4.70 | 97 | 91 | 78 | 69 | 57 | 51 | 43 | 35 | 24 | 15 | 2 | 0 |
| FEB 26 | 4.91 | 96 | 89 | 80 | 72 | 66 | 54 | 45 | 39 | 25 | 16 | 0 | 0 |
| MAR 5 | 5.19 | 97 | 90 | 83 | 75 | 65 | 58 | 52 | 40 | 26 | 14 | 1 | 0 |
| MAR 12 | 4.14 | 95 | 85 | 70 | 57 | 45 | 37 | 36 | 27 | 7 | 4 | 0 | 0 |
| MAR 19 | (4.39) | 95 | 88 | 78 | 74 | 58 | 46 | 34 | 21 | 7 | 0 | 0 | 0 |
| MAR 26 | 4.42 | 94 | 82 | 69 | 59 | 50 | 39 | 30 | 20 | 12 | 4 | 0 | 0 |
| APR 2 | 3.79 | 85 | 75 | 65 | 59 | 50 | 42 | 31 | 20 | 16 | 6 | 0 | 0 |
| APR 9 | 5.53 | 96 | 92 | 86 | 82 | 72 | 62 | 54 | 37 | 27 | 15 | 0 | 0 |
| APR 16 | 4.63 | 94 | 88 | 75 | 58 | 48 | 40 | 36 | 28 | 19 | 9 | 0 | 0 |
| APR 23 | 5.04 | 95 | 89 | 80 | 71 | 64 | 49 | 39 | 27 | 18 | 1 | 0 | 0 |
| APR 30 | 2.68 | 76 | 53 | 34 | 23 | 20 | 17 | 9 | 3 | 1 | 0 | 0 | 0 |
| MAY 7 | 4.33 | 94 | 85 | 69 | 56 | 47 | 37 | 26 | 20 | 9 | 0 | 0 | 0 |
| MAY 14 | 3.76 | 85 | 70 | 62 | 49 | 38 | 31 | 20 | 14 | 3 | 1 | 0 | 0 |
| MAY 21 | (3.45) | 87 | 67 | 49 | 41 | 33 | 23 | 20 | 11 | 2 | 0 | 0 | 0 |
| MAY 28 | (4.13) | 87 | 73 | 58 | 55 | 50 | 41 | 31 | 18 | 0 | 0 | 0 | 0 |
| JUN 4 | 5.22 | 94 | 87 | 80 | 72 | 62 | 53 | 40 | 22 | 1 | 0 | 0 | 0 |
| JUN 11 | 5.30 | 94 | 89 | 84 | 75 | 69 | 59 | 47 | 28 | 1 | 0 | 0 | 0 |
| JUN 18 | 4.52 | 93 | 85 | 76 | 66 | 56 | 46 | 33 | 17 | 0 | 0 | 0 | 0 |
| JUN 25 | 4.37 | 93 | 82 | 68 | 62 | 53 | 50 | 40 | 16 | 0 | 0 | 0 | 0 |
| JUL 2 | 3.30 | 89 | 74 | 63 | 57 | 47 | 32 | 21 | 9 | 2 | 0 | 0 | 0 |
| JUL 9 | 5.65 | 95 | 92 | 87 | 80 | 73 | 63 | 51 | 33 | 3 | 0 | 0 | 0 |
| JUL 16 | 4.39 | 94 | 84 | 71 | 59 | 52 | 44 | 35 | 27 | 1 | 0 | 0 | 0 |
| JUL 23 | 5.47 | 94 | 91 | 87 | 81 | 74 | 64 | 53 | 35 | 1 | 0 | 0 | 0 |
| JUL 30 | 5.67 | 96 | 92 | 87 | 83 | 75 | 65 | 56 | 38 | 1 | 0 | 0 | 0 |
| AUG 6 | 5.81 | 97 | 94 | 88 | 83 | 74 | 65 | 56 | 36 | 0 | 0 | 0 | 0 |
| AUG 13 | 3.45 | 88 | 73 | 57 | 46 | 38 | 30 | 22 | 14 | 6 | 1 | 0 | 0 |
| AUG 20 | 5.48 | 96 | 91 | 86 | 79 | 70 | 59 | 50 | 40 | 23 | 1 | 0 | 0 |
| AUG 27 | 5.51 | 97 | 93 | 83 | 78 | 71 | 61 | 49 | 38 | 22 | 0 | 0 | 0 |
| SEP 3 | 4.45 | 93 | 83 | 76 | 68 | 58 | 55 | 48 | 37 | 22 | 8 | 0 | 0 |
| SEP 10 | 3.47 | 71 | 50 | 47 | 46 | 39 | 32 | 26 | 22 | 14 | 9 | 1 | 0 |
| SEP 17 | 4.56 | 82 | 77 | 69 | 61 | 54 | 48 | 42 | 35 | 29 | 20 | 1 | 0 |
| SEP 24 | 5.46 | 95 | 87 | 83 | 78 | 71 | 63 | 51 | 40 | 29 | 7 | 0 | 0 |
| OCT 1 | 6.00 | 98 | 96 | 89 | 81 | 77 | 69 | 56 | 42 | 26 | 5 | 0 | 0 |
| OCT 8 | 5.62 | 98 | 95 | 90 | 84 | 74 | 65 | 53 | 40 | 25 | 6 | 0 | 0 |
| OCT 15 | 4.52 | 95 | 89 | 80 | 73 | 65 | 55 | 45 | 39 | 23 | 7 | 0 | 0 |
| OCT 22 | 4.45 | 95 | 88 | 80 | 72 | 59 | 55 | 46 | 31 | 19 | 3 | 0 | 0 |
| OCT 29 | 4.63 | 90 | 79 | 75 | 69 | 64 | 60 | 52 | 42 | 28 | 4 | 0 | 0 |
| NOV 5 | 2.93 | 79 | 71 | 64 | 55 | 45 | 36 | 27 | 13 | 7 | 3 | 0 | 0 |
| NOV 12 | 2.64 | 83 | 55 | 46 | 39 | 33 | 31 | 24 | 20 | 13 | 1 | 0 | 0 |
| NOV 19 | 2.11 | 75 | 58 | 46 | 36 | 30 | 23 | 18 | 9 | 6 | 2 | 0 | 0 |
| NOV 26 | 2.42 | 88 | 63 | 48 | 43 | 39 | 26 | 25 | 18 | 12 | 4 | 0 | 0 |
| DEC 3 | 1.75 | 71 | 47 | 30 | 22 | 19 | 17 | 16 | 13 | 6 | 0 | 0 | 0 |
| DEC 10 | 3.23 | 94 | 80 | 72 | 67 | 53 | 42 | 37 | 29 | 8 | 0 | 0 | 0 |
| DEC 17 | 2.11 | 78 | 59 | 47 | 37 | 32 | 26 | 20 | 17 | 7 | 0 | 0 | 0 |
| DEC 24 | 2.89 | 83 | 75 | 61 | 56 | 47 | 43 | 37 | 26 | 10 | 2 | 0 | 0 |

SOLAR RADIATION DATA for: JORDAN,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | | | | | | | | | | | | | |
| FEB 19 | | | | | | | | | | | | | |
| FEB 26 | | | | | | | | | | | | | |
| MAR 5 | | | | | | | | | | | | | |
| MAR 12 | | | | | | | | | | | | | |
| MAR 19 | | | | | | | | | | | | | |
| MAR 26 | | | | | | | | | | | | | |
| APR 2 | | | | | | | | | | | | | |
| APR 9 | | | | | | | | | | | | | |
| APR 16 | | | | | | | | | | | | | |
| APR 23 | | | | | | | | | | | | | |
| APR 30 | (1.75) | 83 | 53 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MAY 7 | 4.05 | 89 | 78 | 65 | 56 | 50 | 39 | 20 | 14 | 5 | 1 | 0 | 0 |
| MAY 14 | 4.03 | 77 | 64 | 62 | 56 | 49 | 46 | 36 | 26 | 5 | 2 | 0 | 0 |
| MAY 21 | 5.37 | 94 | 89 | 83 | 78 | 71 | 62 | 46 | 30 | 3 | 0 | 0 | 0 |
| MAY 28 | 3.60 | 83 | 63 | 58 | 45 | 38 | 32 | 23 | 19 | 7 | 0 | 0 | 0 |
| JUN 4 | 5.14 | 95 | 91 | 85 | 76 | 69 | 57 | 41 | 21 | 2 | 0 | 0 | 0 |
| JUN 11 | 4.52 | 94 | 88 | 82 | 68 | 56 | 41 | 30 | 16 | 3 | 0 | 0 | 0 |
| JUN 18 | 5.33 | 93 | 86 | 84 | 75 | 68 | 59 | 50 | 28 | 0 | 0 | 0 | 0 |
| JUN 25 | 5.25 | 95 | 92 | 88 | 82 | 72 | 62 | 46 | 23 | 3 | 0 | 0 | 0 |
| JUL 2 | 4.39 | 76 | 67 | 61 | 53 | 47 | 38 | 27 | 18 | 6 | 0 | 0 | 0 |
| JUL 9 | 6.01 | 96 | 95 | 93 | 88 | 82 | 72 | 56 | 34 | 0 | 0 | 0 | 0 |
| JUL 16 | 4.23 | 93 | 83 | 72 | 63 | 50 | 35 | 21 | 8 | 0 | 0 | 0 | 0 |
| JUL 23 | 5.50 | 96 | 94 | 85 | 76 | 68 | 57 | 45 | 31 | 0 | 0 | 0 | 0 |
| JUL 30 | 6.15 | 97 | 96 | 91 | 85 | 78 | 69 | 58 | 41 | 8 | 0 | 0 | 0 |
| AUG 6 | 5.83 | 97 | 94 | 90 | 86 | 80 | 67 | 58 | 36 | 3 | 0 | 0 | 0 |
| AUG 13 | 4.80 | 95 | 89 | 74 | 66 | 58 | 46 | 40 | 27 | 8 | 0 | 0 | 0 |
| AUG 20 | 6.04 | 95 | 91 | 87 | 83 | 77 | 69 | 56 | 43 | 20 | 0 | 0 | 0 |
| AUG 27 | (4.95) | 91 | 80 | 71 | 68 | 62 | 55 | 48 | 39 | 25 | 2 | 0 | 0 |
| SEP 3 | (6.02) | 98 | 94 | 91 | 85 | 79 | 72 | 60 | 51 | 22 | 0 | 0 | 0 |
| SEP 10 | 3.70 | 67 | 54 | 51 | 46 | 45 | 40 | 35 | 27 | 19 | 3 | 0 | 0 |
| SEP 17 | 4.64 | 83 | 78 | 74 | 68 | 62 | 56 | 46 | 33 | 17 | 1 | 0 | 0 |
| SEP 24 | 5.60 | 97 | 95 | 91 | 88 | 78 | 69 | 56 | 40 | 16 | 0 | 0 | 0 |
| OCT 1 | 4.96 | 90 | 81 | 78 | 73 | 67 | 60 | 48 | 36 | 22 | 0 | 0 | 0 |
| OCT 8 | 4.94 | 97 | 94 | 87 | 78 | 70 | 63 | 47 | 34 | 14 | 1 | 0 | 0 |
| OCT 15 | 3.73 | 82 | 73 | 68 | 63 | 54 | 43 | 28 | 18 | 8 | 0 | 0 | 0 |
| OCT 22 | 3.91 | 94 | 82 | 73 | 64 | 48 | 41 | 34 | 25 | 1 | 0 | 0 | 0 |
| OCT 29 | 3.86 | 92 | 83 | 73 | 64 | 60 | 53 | 42 | 24 | 0 | 0 | 0 | 0 |
| NOV 5 | (2.15) | 58 | 47 | 36 | 33 | 29 | 26 | 23 | 16 | 2 | 0 | 0 | 0 |
| NOV 12 | 2.42 | 63 | 42 | 40 | 37 | 35 | 30 | 26 | 9 | 0 | 0 | 0 | 0 |
| NOV 19 | 1.97 | 64 | 40 | 36 | 33 | 27 | 22 | 14 | 7 | 1 | 0 | 0 | 0 |
| NOV 26 | 2.39 | 91 | 71 | 63 | 52 | 38 | 23 | 12 | 0 | 0 | 0 | 0 | 0 |
| DEC 3 | 2.54 | 90 | 74 | 64 | 58 | 50 | 36 | 24 | 6 | 0 | 0 | 0 | 0 |
| DEC 10 | 1.94 | 79 | 56 | 50 | 36 | 32 | 15 | 2 | 0 | 0 | 0 | 0 | 0 |
| DEC 17 | 1.65 | 85 | 56 | 46 | 38 | 28 | 21 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 24 | (1.54) | 83 | 54 | 32 | 21 | 21 | 21 | 10 | 0 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: KALISPELL,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | 1.65 | 82 | 44 | 36 | 30 | 16 | 15 | 11 | 5 | 5 | 2 | 0 | 0 |
| JAN 8 | 1.52 | 75 | 16 | 14 | 14 | 12 | 12 | 11 | 10 | 9 | 4 | 0 | 0 |
| JAN 15 | 1.12 | 71 | 23 | 18 | 12 | 7 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAN 22 | 1.88 | 78 | 36 | 31 | 28 | 25 | 18 | 15 | 15 | 12 | 7 | 0 | 0 |
| JAN 29 | 2.07 | 88 | 47 | 42 | 34 | 30 | 22 | 14 | 9 | 4 | 0 | 0 | 0 |
| FEB 5 | 2.07 | 87 | 56 | 42 | 31 | 27 | 27 | 22 | 21 | 16 | 6 | 3 | 0 |
| FEB 12 | 3.58 | 93 | 75 | 59 | 57 | 52 | 46 | 42 | 33 | 20 | 6 | 1 | 0 |
| FEB 19 | 3.05 | 84 | 62 | 52 | 45 | 38 | 34 | 30 | 20 | 14 | 5 | 0 | 0 |
| FEB 26 | 4.50 | 95 | 87 | 71 | 52 | 45 | 42 | 33 | 32 | 26 | 22 | 14 | 0 |
| MAR 5 | 2.98 | 93 | 69 | 53 | 41 | 31 | 21 | 14 | 8 | 6 | 6 | 0 | 0 |
| MAR 12 | 3.88 | 94 | 70 | 55 | 49 | 44 | 38 | 34 | 31 | 24 | 11 | 5 | 0 |
| MAR 19 | 5.49 | 97 | 92 | 85 | 80 | 72 | 63 | 57 | 51 | 38 | 16 | 7 | 0 |
| MAR 26 | 3.82 | 92 | 69 | 60 | 53 | 44 | 40 | 29 | 23 | 11 | 4 | 0 | 0 |
| APR 2 | 3.33 | 95 | 78 | 58 | 43 | 32 | 26 | 19 | 13 | 4 | 0 | 0 | 0 |
| APR 9 | 4.98 | 94 | 86 | 77 | 66 | 58 | 52 | 41 | 29 | 19 | 10 | 0 | 0 |
| APR 16 | 3.73 | 90 | 70 | 53 | 44 | 40 | 35 | 29 | 21 | 17 | 7 | 3 | 0 |
| APR 23 | 2.74 | 89 | 58 | 38 | 27 | 21 | 11 | 8 | 4 | 0 | 0 | 0 | 0 |
| APR 30 | 4.44 | 93 | 85 | 70 | 63 | 56 | 47 | 37 | 32 | 23 | 7 | 0 | 0 |
| MAY 7 | 3.71 | 92 | 71 | 55 | 45 | 37 | 31 | 25 | 16 | 11 | 4 | 0 | 0 |
| MAY 14 | (3.75) | 92 | 71 | 57 | 43 | 35 | 26 | 22 | 17 | 8 | 0 | 0 | 0 |
| MAY 21 | 3.08 | 82 | 68 | 54 | 43 | 38 | 27 | 18 | 14 | 6 | 2 | 0 | 0 |
| MAY 28 | 4.88 | 95 | 85 | 72 | 64 | 57 | 48 | 40 | 32 | 5 | 0 | 0 | 0 |
| JUN 4 | 5.62 | 95 | 89 | 83 | 75 | 70 | 59 | 46 | 35 | 13 | 0 | 0 | 0 |
| JUN 11 | 4.10 | 94 | 82 | 65 | 52 | 42 | 32 | 25 | 16 | 5 | 0 | 0 | 0 |
| JUN 18 | 4.95 | 94 | 89 | 83 | 73 | 67 | 54 | 41 | 28 | 4 | 0 | 0 | 0 |
| JUN 25 | 4.25 | 89 | 73 | 67 | 58 | 51 | 44 | 34 | 24 | 4 | 0 | 0 | 0 |
| JUL 2 | (4.11) | 92 | 78 | 67 | 56 | 49 | 39 | 30 | 15 | 2 | 0 | 0 | 0 |
| JUL 9 | (5.03) | 95 | 88 | 82 | 72 | 66 | 57 | 48 | 24 | 2 | 0 | 0 | 0 |
| JUL 16 | 4.16 | 90 | 76 | 67 | 60 | 54 | 41 | 29 | 14 | 0 | 0 | 0 | 0 |
| JUL 23 | 5.35 | 96 | 93 | 87 | 81 | 72 | 59 | 43 | 17 | 0 | 0 | 0 | 0 |
| JUL 30 | 5.53 | 97 | 93 | 89 | 83 | 75 | 66 | 50 | 23 | 0 | 0 | 0 | 0 |
| AUG 6 | 5.01 | 96 | 88 | 81 | 73 | 64 | 54 | 35 | 19 | 0 | 0 | 0 | 0 |
| AUG 13 | 2.95 | 86 | 69 | 52 | 42 | 29 | 21 | 15 | 6 | 3 | 0 | 0 | 0 |
| AUG 20 | 3.33 | 82 | 65 | 55 | 43 | 34 | 29 | 21 | 10 | 1 | 0 | 0 | 0 |
| AUG 27 | 5.05 | 96 | 90 | 85 | 78 | 66 | 59 | 49 | 27 | 8 | 0 | 0 | 0 |
| SEP 3 | 3.80 | 91 | 70 | 59 | 50 | 44 | 36 | 31 | 26 | 16 | 4 | 0 | 0 |
| SEP 10 | 2.58 | 79 | 60 | 49 | 45 | 37 | 31 | 23 | 19 | 13 | 0 | 0 | 0 |
| SEP 17 | 3.24 | 92 | 86 | 77 | 66 | 53 | 37 | 30 | 18 | 3 | 0 | 0 | 0 |
| SEP 24 | 4.18 | 90 | 76 | 66 | 58 | 50 | 41 | 36 | 32 | 22 | 4 | 0 | 0 |
| OCT 1 | 5.57 | 98 | 93 | 87 | 84 | 76 | 64 | 55 | 48 | 32 | 5 | 0 | 0 |
| OCT 8 | 4.93 | 91 | 84 | 78 | 72 | 65 | 61 | 52 | 38 | 22 | 0 | 0 | 0 |
| OCT 15 | 4.39 | 98 | 94 | 88 | 80 | 70 | 57 | 44 | 31 | 10 | 0 | 0 | 0 |
| OCT 22 | 3.99 | 96 | 85 | 78 | 70 | 61 | 56 | 45 | 26 | 11 | 1 | 0 | 0 |
| OCT 29 | (3.87) | 89 | 79 | 71 | 68 | 61 | 54 | 44 | 34 | 6 | 0 | 0 | 0 |
| NOV 5 | 2.75 | 83 | 69 | 62 | 53 | 38 | 26 | 23 | 19 | 8 | 2 | 0 | 0 |
| NOV 12 | 2.69 | 72 | 58 | 55 | 51 | 45 | 43 | 36 | 30 | 17 | 4 | 0 | 0 |
| NOV 19 | 1.46 | 70 | 21 | 18 | 15 | 12 | 11 | 11 | 9 | 8 | 3 | 0 | 0 |
| NOV 26 | 1.42 | 70 | 42 | 33 | 29 | 24 | 16 | 14 | 5 | 5 | 0 | 0 | 0 |
| DEC 3 | 1.64 | 60 | 36 | 32 | 27 | 22 | 17 | 11 | 8 | 4 | 0 | 0 | 0 |
| DEC 10 | 3.05 | 91 | 72 | 67 | 60 | 54 | 46 | 39 | 26 | 18 | 3 | 0 | 0 |
| DEC 17 | 1.17 | 61 | 22 | 19 | 18 | 17 | 16 | 14 | 12 | 12 | 2 | 0 | 0 |
| DEC 24 | 2.21 | 79 | 56 | 48 | 40 | 25 | 21 | 18 | 16 | 12 | 3 | 0 | 0 |

SOLAR RADIATION DATA for: LEWISTOWN, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 2.98 | 91 | 71 | 60 | 55 | 47 | 44 | 33 | 22 | 13 | 0 | 0 | 0 |
| JAN 8 | (2.39) | 84 | 47 | 46 | 42 | 37 | 34 | 29 | 22 | 13 | 2 | 0 | 0 |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | (3.70) | 94 | 79 | 69 | 65 | 65 | 60 | 56 | 41 | 28 | 20 | 6 | 0 |
| FEB 5 | 2.40 | 90 | 62 | 32 | 27 | 21 | 18 | 17 | 16 | 7 | 6 | 0 | 0 |
| FEB 12 | 4.11 | 95 | 86 | 77 | 62 | 55 | 50 | 42 | 33 | 18 | 11 | 0 | 0 |
| FEB 19 | 3.93 | 93 | 68 | 61 | 54 | 45 | 44 | 39 | 30 | 23 | 14 | 1 | 0 |
| FEB 26 | 5.95 | 98 | 95 | 89 | 86 | 82 | 74 | 65 | 58 | 41 | 21 | 0 | 0 |
| MAR 5 | 4.54 | 94 | 80 | 74 | 60 | 51 | 45 | 39 | 28 | 19 | 9 | 0 | 0 |
| MAR 12 | 4.22 | 96 | 85 | 69 | 56 | 49 | 41 | 33 | 27 | 20 | 10 | 0 | 0 |
| MAR 19 | 5.70 | 98 | 94 | 88 | 78 | 69 | 62 | 57 | 45 | 30 | 10 | 0 | 0 |
| MAR 26 | 4.79 | 96 | 92 | 80 | 69 | 58 | 51 | 42 | 32 | 14 | 0 | 0 | 0 |
| APR 2 | 4.70 | 95 | 88 | 80 | 73 | 63 | 50 | 36 | 31 | 18 | 10 | 1 | 0 |
| APR 9 | 5.08 | 95 | 89 | 79 | 68 | 58 | 53 | 49 | 41 | 32 | 11 | 0 | 0 |
| APR 16 | 3.42 | 82 | 65 | 52 | 47 | 39 | 32 | 25 | 18 | 6 | 3 | 0 | 0 |
| APR 23 | (2.23) | 80 | 53 | 34 | 19 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| APR 30 | (3.05) | 92 | 77 | 56 | 50 | 31 | 20 | 11 | 6 | 0 | 0 | 0 | 0 |
| MAY 7 | 4.12 | 92 | 80 | 68 | 59 | 43 | 35 | 26 | 22 | 5 | 0 | 0 | 0 |
| MAY 14 | 3.58 | 74 | 61 | 50 | 43 | 38 | 33 | 22 | 14 | 4 | 0 | 0 | 0 |
| MAY 21 | 5.23 | 95 | 90 | 84 | 77 | 65 | 57 | 46 | 30 | 9 | 1 | 0 | 0 |
| MAY 28 | 4.46 | 88 | 78 | 68 | 61 | 54 | 43 | 31 | 24 | 12 | 3 | 0 | 0 |
| JUN 4 | 5.09 | 95 | 87 | 76 | 66 | 58 | 49 | 41 | 23 | 1 | 0 | 0 | 0 |
| JUN 11 | 4.74 | 94 | 89 | 82 | 73 | 64 | 48 | 41 | 25 | 8 | 1 | 0 | 0 |
| JUN 18 | 4.78 | 95 | 86 | 79 | 72 | 64 | 54 | 40 | 18 | 0 | 0 | 0 | 0 |
| JUN 25 | 4.66 | 81 | 78 | 73 | 68 | 62 | 55 | 44 | 27 | 0 | 0 | 0 | 0 |
| JUL 2 | 3.29 | 89 | 66 | 58 | 46 | 30 | 24 | 17 | 11 | 2 | 0 | 0 | 0 |
| JUL 9 | 5.45 | 95 | 93 | 87 | 79 | 71 | 64 | 51 | 30 | 4 | 0 | 0 | 0 |
| JUL 16 | 4.05 | 93 | 79 | 67 | 59 | 50 | 38 | 31 | 15 | 0 | 0 | 0 | 0 |
| JUL 23 | (5.80) | 97 | 93 | 91 | 85 | 77 | 72 | 55 | 28 | 0 | 0 | 0 | 0 |
| JUL 30 | | | | | | | | | | | | | |
| AUG 6 | | | | | | | | | | | | | |
| AUG 13 | | | | | | | | | | | | | |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | | | | | | | | | | | | | |
| SEP 3 | (5.83) | 97 | 93 | 89 | 83 | 79 | 75 | 64 | 53 | 34 | 3 | 0 | 0 |
| SEP 10 | 2.94 | 78 | 52 | 39 | 35 | 33 | 30 | 26 | 21 | 9 | 0 | 0 | 0 |
| SEP 17 | 4.29 | 83 | 77 | 69 | 62 | 51 | 46 | 42 | 34 | 25 | 2 | 0 | 0 |
| SEP 24 | 5.48 | 97 | 93 | 89 | 81 | 73 | 65 | 53 | 41 | 22 | 1 | 0 | 0 |
| OCT 1 | 5.67 | 97 | 92 | 86 | 76 | 71 | 64 | 56 | 46 | 33 | 10 | 1 | 0 |
| OCT 8 | 5.18 | 98 | 93 | 85 | 77 | 69 | 61 | 53 | 38 | 21 | 0 | 0 | 0 |
| OCT 15 | 3.90 | 82 | 76 | 68 | 58 | 47 | 37 | 32 | 24 | 14 | 0 | 0 | 0 |
| OCT 22 | (4.29) | 97 | 84 | 77 | 68 | 61 | 55 | 45 | 33 | 9 | 1 | 0 | 0 |
| OCT 29 | (6.45) | 99 | 98 | 96 | 90 | 88 | 82 | 73 | 64 | 46 | 8 | 0 | 0 |
| NOV 5 | | | | | | | | | | | | | |
| NOV 12 | (1.05) | 77 | 26 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOV 19 | (2.66) | 85 | 62 | 59 | 52 | 35 | 19 | 10 | 0 | 0 | 0 | 0 | 0 |
| NOV 26 | (2.74) | 94 | 76 | 64 | 43 | 37 | 28 | 20 | 14 | 2 | 0 | 0 | 0 |
| DEC 3 | | | | | | | | | | | | | |
| DEC 10 | (3.20) | 88 | 65 | 56 | 47 | 43 | 38 | 35 | 28 | 8 | 0 | 0 | 0 |
| DEC 17 | (3.66) | 96 | 92 | 86 | 79 | 70 | 57 | 48 | 44 | 30 | 4 | 0 | 0 |
| DEC 24 | (2.12) | 82 | 54 | 40 | 34 | 27 | 24 | 20 | 14 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: LIBBY, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | (2.45) | 93 | 80 | 55 | 49 | 42 | 42 | 42 | 37 | 23 | 6 | 6 | 0 |
| FEB 12 | 3.55 | 96 | 87 | 77 | 70 | 59 | 48 | 40 | 32 | 15 | 5 | 0 | 0 |
| FEB 19 | 2.67 | 92 | 71 | 54 | 41 | 29 | 26 | 23 | 12 | 2 | 0 | 0 | 0 |
| FEB 26 | 3.46 | 89 | 57 | 45 | 39 | 36 | 34 | 33 | 32 | 25 | 18 | 2 | 0 |
| MAR 5 | 2.86 | 90 | 69 | 50 | 41 | 37 | 30 | 23 | 14 | 10 | 3 | 0 | 0 |
| MAR 12 | 3.66 | 93 | 74 | 62 | 53 | 43 | 38 | 27 | 19 | 6 | 3 | 0 | 0 |
| MAR 19 | 4.65 | 95 | 89 | 84 | 77 | 73 | 62 | 51 | 43 | 24 | 7 | 0 | 0 |
| MAR 26 | 2.70 | 84 | 59 | 43 | 34 | 27 | 27 | 25 | 16 | 6 | 0 | 0 | 0 |
| APR 2 | 3.19 | 92 | 83 | 63 | 49 | 36 | 29 | 22 | 12 | 7 | 0 | 0 | 0 |
| APR 9 | (4.88) | 95 | 87 | 84 | 68 | 62 | 59 | 42 | 22 | 16 | 7 | 0 | 0 |
| APR 16 | 3.73 | 93 | 83 | 70 | 46 | 37 | 29 | 24 | 18 | 11 | 1 | 0 | 0 |
| APR 23 | 2.70 | 83 | 56 | 42 | 34 | 25 | 11 | 2 | 0 | 0 | 0 | 0 | 0 |
| APR 30 | 4.02 | 93 | 77 | 69 | 58 | 48 | 41 | 32 | 24 | 11 | 1 | 0 | 0 |
| MAY 7 | 3.48 | 85 | 65 | 51 | 40 | 34 | 29 | 21 | 16 | 11 | 5 | 0 | 0 |
| MAY 14 | 4.04 | 93 | 76 | 60 | 48 | 40 | 35 | 28 | 25 | 9 | 1 | 0 | 0 |
| MAY 21 | 3.48 | 89 | 71 | 55 | 41 | 27 | 18 | 15 | 9 | 4 | 0 | 0 | 0 |
| MAY 28 | 4.32 | 93 | 80 | 65 | 55 | 41 | 33 | 26 | 18 | 0 | 0 | 0 | 0 |
| JUN 4 | 5.22 | 96 | 90 | 84 | 80 | 71 | 60 | 45 | 22 | 0 | 0 | 0 | 0 |
| JUN 11 | 3.28 | 91 | 76 | 56 | 42 | 24 | 15 | 3 | 0 | 0 | 0 | 0 | 0 |
| JUN 18 | 5.54 | 95 | 91 | 86 | 81 | 70 | 56 | 47 | 34 | 3 | 0 | 0 | 0 |
| JUN 25 | 4.29 | 94 | 84 | 73 | 61 | 54 | 40 | 27 | 17 | 0 | 0 | 0 | 0 |
| JUL 2 | 4.35 | 94 | 85 | 77 | 69 | 58 | 47 | 40 | 27 | 0 | 0 | 0 | 0 |
| JUL 9 | 4.42 | 92 | 80 | 71 | 61 | 51 | 41 | 33 | 23 | 1 | 0 | 0 | 0 |
| JUL 16 | 4.56 | 93 | 78 | 69 | 64 | 53 | 42 | 36 | 25 | 3 | 0 | 0 | 0 |
| JUL 23 | (5.70) | 97 | 94 | 87 | 84 | 76 | 55 | 44 | 37 | 0 | 0 | 0 | 0 |
| JUL 30 | (6.13) | 97 | 93 | 89 | 87 | 79 | 71 | 60 | 48 | 0 | 0 | 0 | 0 |
| AUG 6 | 4.50 | 89 | 80 | 72 | 67 | 58 | 48 | 39 | 26 | 1 | 0 | 0 | 0 |
| AUG 13 | 2.88 | 83 | 66 | 54 | 41 | 30 | 27 | 17 | 10 | 1 | 0 | 0 | 0 |
| AUG 20 | 2.88 | 90 | 59 | 49 | 36 | 27 | 23 | 19 | 13 | 7 | 0 | 0 | 0 |
| AUG 27 | 4.51 | 92 | 82 | 74 | 66 | 58 | 48 | 36 | 27 | 20 | 3 | 0 | 0 |
| SEP 3 | 3.65 | 90 | 71 | 68 | 56 | 49 | 39 | 30 | 23 | 8 | 0 | 0 | 0 |
| SEP 10 | (2.53) | 89 | 73 | 51 | 36 | 28 | 15 | 11 | 9 | 6 | 5 | 0 | 0 |
| SEP 17 | 3.21 | 87 | 72 | 58 | 53 | 50 | 43 | 38 | 23 | 15 | 5 | 3 | 0 |
| SEP 24 | 3.13 | 93 | 78 | 69 | 62 | 52 | 40 | 35 | 29 | 14 | 0 | 0 | 0 |
| OCT 1 | 5.10 | 98 | 95 | 91 | 86 | 79 | 73 | 63 | 50 | 30 | 1 | 0 | 0 |
| OCT 8 | (4.27) | 91 | 85 | 78 | 67 | 62 | 57 | 48 | 36 | 25 | 0 | 0 | 0 |
| OCT 15 | 4.17 | 98 | 93 | 87 | 79 | 72 | 64 | 56 | 44 | 15 | 0 | 0 | 0 |
| OCT 22 | 3.43 | 96 | 85 | 74 | 70 | 65 | 49 | 35 | 18 | 10 | 0 | 0 | 0 |
| OCT 29 | 2.77 | 89 | 77 | 72 | 64 | 55 | 46 | 34 | 28 | 15 | 0 | 0 | 0 |
| NOV 5 | 2.85 | 81 | 69 | 60 | 51 | 43 | 39 | 35 | 27 | 8 | 0 | 0 | 0 |
| NOV 12 | 1.75 | 54 | 44 | 42 | 40 | 33 | 29 | 21 | 8 | 0 | 0 | 0 | 0 |
| NOV 19 | 1.45 | 59 | 51 | 39 | 35 | 29 | 23 | 19 | 11 | 7 | 0 | 0 | 0 |
| NOV 26 | 1.35 | 52 | 33 | 29 | 28 | 28 | 22 | 19 | 15 | 12 | 0 | 0 | 0 |
| DEC 3 | (1.20) | 65 | 48 | 38 | 20 | 13 | 13 | 9 | 9 | 0 | 0 | 0 | 0 |
| DEC 10 | (3.22) | 96 | 88 | 77 | 64 | 61 | 60 | 52 | 39 | 21 | 0 | 0 | 0 |
| DEC 17 | .82 | 49 | 27 | 27 | 27 | 21 | 14 | 9 | 9 | 3 | 0 | 0 | 0 |
| DEC 24 | (1.92) | 77 | 66 | 60 | 42 | 30 | 26 | 18 | 6 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: LIVINGSTON, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | (4.60) | 97 | 85 | 78 | 73 | 63 | 56 | 43 | 35 | 28 | 17 | 4 | 0 |
| FEB 19 | 3.45 | 94 | 73 | 59 | 55 | 48 | 42 | 34 | 23 | 13 | 9 | 4 | 0 |
| FEB 26 | 4.41 | 96 | 80 | 71 | 66 | 54 | 52 | 46 | 41 | 36 | 31 | 14 | 0 |
| MAR 5 | 4.71 | 95 | 88 | 82 | 73 | 65 | 59 | 47 | 40 | 29 | 20 | 11 | 5 |
| MAR 12 | 3.98 | 95 | 80 | 62 | 52 | 46 | 42 | 39 | 32 | 25 | 20 | 2 | 2 |
| MAR 19 | 3.75 | 84 | 70 | 64 | 56 | 48 | 42 | 33 | 24 | 16 | 10 | 0 | 0 |
| MAR 26 | 6.08 | 97 | 94 | 91 | 87 | 81 | 74 | 65 | 53 | 45 | 26 | 2 | 0 |
| APR 2 | (4.36) | 95 | 91 | 78 | 71 | 65 | 57 | 49 | 40 | 31 | 23 | 9 | 0 |
| APR 9 | | | | | | | | | | | | | |
| APR 16 | (4.23) | 94 | 79 | 59 | 48 | 41 | 37 | 31 | 27 | 14 | 4 | 0 | 0 |
| APR 23 | 4.19 | 93 | 82 | 68 | 55 | 46 | 38 | 23 | 20 | 14 | 6 | 0 | 0 |
| APR 30 | 2.74 | 85 | 64 | 44 | 32 | 24 | 18 | 13 | 9 | 5 | 4 | 0 | 0 |
| MAY 7 | 4.44 | 94 | 81 | 74 | 68 | 55 | 43 | 34 | 26 | 18 | 4 | 0 | 0 |
| MAY 14 | 3.52 | 75 | 57 | 48 | 42 | 35 | 31 | 28 | 22 | 5 | 3 | 0 | 0 |
| MAY 21 | (4.58) | 95 | 89 | 78 | 71 | 59 | 47 | 35 | 18 | 4 | 0 | 0 | 0 |
| MAY 28 | 3.67 | 85 | 65 | 55 | 48 | 40 | 33 | 29 | 19 | 3 | 0 | 0 | 0 |
| JUN 4 | (5.05) | 94 | 88 | 81 | 70 | 65 | 57 | 48 | 36 | 0 | 0 | 0 | 0 |
| JUN 11 | | | | | | | | | | | | | |
| JUN 18 | | | | | | | | | | | | | |
| JUN 25 | (5.26) | 95 | 91 | 86 | 81 | 69 | 62 | 44 | 27 | 2 | 0 | 0 | 0 |
| JUL 2 | 3.97 | 93 | 75 | 65 | 60 | 52 | 41 | 29 | 18 | 5 | 0 | 0 | 0 |
| JUL 9 | 4.85 | 93 | 85 | 78 | 72 | 67 | 54 | 41 | 25 | 1 | 0 | 0 | 0 |
| JUL 16 | 4.47 | 94 | 77 | 71 | 64 | 58 | 49 | 41 | 27 | 3 | 0 | 0 | 0 |
| JUL 23 | 5.39 | 95 | 89 | 86 | 79 | 73 | 64 | 53 | 38 | 4 | 0 | 0 | 0 |
| JUL 30 | 5.68 | 96 | 92 | 87 | 82 | 77 | 70 | 59 | 45 | 9 | 0 | 0 | 0 |
| AUG 6 | 5.56 | 96 | 92 | 85 | 79 | 74 | 64 | 51 | 33 | 7 | 0 | 0 | 0 |
| AUG 13 | (3.31) | 94 | 74 | 60 | 57 | 44 | 32 | 19 | 12 | 4 | 0 | 0 | 0 |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | | | | | | | | | | | | | |
| SEP 3 | | | | | | | | | | | | | |
| SEP 10 | | | | | | | | | | | | | |
| SEP 17 | (5.27) | 97 | 91 | 88 | 80 | 75 | 68 | 54 | 47 | 24 | 7 | 0 | 0 |
| SEP 24 | 5.00 | 94 | 87 | 83 | 78 | 71 | 62 | 48 | 37 | 7 | 0 | 0 | 0 |
| OCT 1 | 5.93 | 98 | 96 | 92 | 87 | 81 | 71 | 55 | 44 | 34 | 13 | 1 | 0 |
| OCT 8 | 4.87 | 96 | 92 | 86 | 78 | 66 | 57 | 48 | 37 | 29 | 8 | 0 | 0 |
| OCT 15 | (3.62) | 95 | 85 | 73 | 58 | 57 | 52 | 39 | 27 | 13 | 5 | 0 | 0 |
| OCT 22 | (4.08) | 98 | 91 | 82 | 75 | 67 | 56 | 47 | 40 | 30 | 12 | 0 | 0 |
| OCT 29 | (4.13) | 82 | 76 | 72 | 68 | 62 | 56 | 46 | 39 | 31 | 4 | 0 | 0 |
| NOV 5 | (3.45) | 90 | 75 | 70 | 59 | 56 | 43 | 30 | 23 | 13 | 0 | 0 | 0 |
| NOV 12 | (3.84) | 94 | 72 | 65 | 54 | 54 | 44 | 35 | 31 | 25 | 21 | 6 | 3 |
| NOV 19 | | | | | | | | | | | | | |
| NOV 26 | | | | | | | | | | | | | |
| DEC 3 | (2.24) | 92 | 75 | 59 | 42 | 36 | 28 | 24 | 20 | 15 | 4 | 0 | 0 |
| DEC 10 | (2.16) | 85 | 65 | 58 | 50 | 39 | 22 | 20 | 20 | 6 | 0 | 0 | 0 |
| DEC 17 | | | | | | | | | | | | | |
| DEC 24 | | | | | | | | | | | | | |

SOLAR RADIATION DATA for: MILES CITY, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 2.96 | 93 | 82 | 67 | 53 | 37 | 32 | 24 | 18 | 11 | 0 | 0 | 0 |
| JAN 8 | 3.06 | 95 | 76 | 61 | 53 | 44 | 40 | 32 | 24 | 21 | 3 | 0 | 0 |
| JAN 15 | 3.73 | 93 | 73 | 63 | 60 | 56 | 49 | 42 | 34 | 25 | 5 | 0 | 0 |
| JAN 22 | 2.69 | 90 | 65 | 52 | 42 | 34 | 25 | 18 | 14 | 8 | 2 | 0 | 0 |
| JAN 29 | 3.95 | 96 | 81 | 72 | 63 | 54 | 50 | 37 | 29 | 20 | 10 | 0 | 0 |
| FEB 5 | 1.84 | 87 | 53 | 28 | 14 | 10 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| FEB 12 | (3.60) | 96 | 87 | 73 | 64 | 50 | 31 | 27 | 13 | 6 | 0 | 0 | 0 |
| FEB 19 | (5.10) | 96 | 93 | 88 | 79 | 71 | 69 | 57 | 46 | 35 | 24 | 1 | 0 |
| FEB 26 | 5.66 | 97 | 93 | 83 | 77 | 73 | 71 | 62 | 54 | 43 | 26 | 0 | 0 |
| MAR 5 | 4.49 | 96 | 90 | 78 | 64 | 54 | 50 | 43 | 37 | 28 | 14 | 0 | 0 |
| MAR 12 | 4.38 | 96 | 86 | 76 | 69 | 55 | 46 | 38 | 29 | 20 | 11 | 3 | 0 |
| MAR 19 | 4.25 | 93 | 79 | 64 | 57 | 52 | 47 | 40 | 32 | 25 | 13 | 0 | 0 |
| MAR 26 | 4.75 | 95 | 84 | 75 | 64 | 52 | 46 | 39 | 30 | 18 | 0 | 0 | 0 |
| APR 2 | 5.56 | 97 | 93 | 87 | 80 | 75 | 69 | 60 | 48 | 36 | 4 | 2 | 0 |
| APR 9 | 4.37 | 81 | 78 | 66 | 62 | 54 | 48 | 40 | 32 | 23 | 4 | 0 | 0 |
| APR 16 | 3.38 | 84 | 69 | 48 | 35 | 31 | 26 | 22 | 16 | 12 | 4 | 0 | 0 |
| APR 23 | 3.59 | 68 | 62 | 52 | 46 | 39 | 34 | 26 | 20 | 11 | 1 | 0 | 0 |
| APR 30 | 2.58 | 85 | 56 | 34 | 18 | 14 | 12 | 9 | 7 | 3 | 0 | 0 | 0 |
| MAY 7 | 3.50 | 83 | 67 | 58 | 48 | 42 | 35 | 24 | 18 | 4 | 0 | 0 | 0 |
| MAY 14 | 3.03 | 70 | 55 | 46 | 36 | 33 | 26 | 18 | 11 | 0 | 0 | 0 | 0 |
| MAY 21 | 5.75 | 96 | 92 | 88 | 82 | 74 | 66 | 54 | 29 | 0 | 0 | 0 | 0 |
| MAY 28 | 3.60 | 81 | 65 | 53 | 46 | 37 | 31 | 25 | 15 | 0 | 0 | 0 | 0 |
| JUN 4 | 5.08 | 95 | 89 | 83 | 72 | 62 | 53 | 38 | 11 | 0 | 0 | 0 | 0 |
| JUN 11 | 4.40 | 94 | 89 | 78 | 66 | 53 | 37 | 26 | 5 | 0 | 0 | 0 | 0 |
| JUN 18 | 4.89 | 93 | 84 | 76 | 69 | 63 | 53 | 40 | 18 | 0 | 0 | 0 | 0 |
| JUN 25 | 4.49 | 93 | 84 | 69 | 62 | 54 | 44 | 35 | 11 | 0 | 0 | 0 | 0 |
| JUL 2 | 4.34 | 93 | 85 | 73 | 61 | 54 | 46 | 36 | 12 | 1 | 0 | 0 | 0 |
| JUL 9 | 5.66 | 96 | 93 | 89 | 83 | 74 | 65 | 50 | 25 | 2 | 1 | 0 | 0 |
| JUL 16 | 3.99 | 91 | 82 | 70 | 55 | 42 | 36 | 22 | 12 | 0 | 0 | 0 | 0 |
| JUL 23 | (5.88) | 96 | 93 | 91 | 85 | 77 | 67 | 56 | 36 | 0 | 0 | 0 | 0 |
| JUL 30 | | | | | | | | | | | | | |
| AUG 6 | | | | | | | | | | | | | |
| AUG 13 | | | | | | | | | | | | | |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | | | | | | | | | | | | | |
| SEP 3 | | | | | | | | | | | | | |
| SEP 10 | (3.40) | 57 | 48 | 46 | 42 | 39 | 34 | 29 | 27 | 19 | 12 | 0 | 0 |
| SEP 17 | 4.54 | 82 | 74 | 70 | 63 | 59 | 55 | 51 | 43 | 35 | 13 | 0 | 0 |
| SEP 24 | 6.25 | 98 | 96 | 93 | 89 | 82 | 76 | 68 | 57 | 38 | 8 | 0 | 0 |
| OCT 1 | 5.04 | 96 | 84 | 76 | 68 | 63 | 56 | 50 | 43 | 27 | 1 | 0 | 0 |
| OCT 8 | 4.83 | 97 | 91 | 85 | 79 | 73 | 63 | 54 | 41 | 23 | 0 | 0 | 0 |
| OCT 15 | 4.07 | 92 | 80 | 72 | 60 | 51 | 44 | 32 | 24 | 10 | 0 | 0 | 0 |
| OCT 22 | 4.46 | 93 | 87 | 85 | 72 | 60 | 50 | 41 | 31 | 22 | 6 | 0 | 0 |
| OCT 29 | 4.71 | 89 | 80 | 77 | 71 | 61 | 55 | 48 | 42 | 25 | 5 | 0 | 0 |
| NOV 5 | 3.03 | 79 | 58 | 51 | 49 | 44 | 39 | 34 | 25 | 16 | 10 | 1 | 0 |
| NOV 12 | 3.12 | 81 | 56 | 45 | 39 | 38 | 34 | 30 | 26 | 18 | 1 | 0 | 0 |
| NOV 19 | 3.68 | 90 | 71 | 66 | 64 | 61 | 54 | 43 | 33 | 12 | 0 | 0 | 0 |
| NOV 26 | 2.14 | 85 | 62 | 55 | 47 | 38 | 26 | 18 | 12 | 7 | 4 | 0 | 0 |
| DEC 3 | 3.16 | 79 | 67 | 65 | 61 | 53 | 48 | 43 | 36 | 20 | 4 | 0 | 0 |
| DEC 10 | 3.24 | 88 | 78 | 73 | 67 | 60 | 50 | 42 | 35 | 21 | 13 | 0 | 0 |
| DEC 17 | 1.58 | 76 | 47 | 32 | 29 | 17 | 13 | 11 | 7 | 5 | 2 | 0 | 0 |
| DEC 24 | 3.29 | 91 | 84 | 72 | 67 | 55 | 49 | 40 | 31 | 16 | 4 | 0 | 0 |

SOLAR RADIATION DATA for: MISSOULA,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 1.93 | 76 | 51 | 36 | 32 | 30 | 25 | 17 | 8 | 0 | 0 | 0 | 0 |
| JAN 8 | ( .34) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAN 15 | (1.21) | 75 | 47 | 29 | 19 | 16 | 8 | 4 | 4 | 0 | 0 | 0 | 0 |
| JAN 22 | 1.13 | 54 | 22 | 21 | 18 | 12 | 9 | 5 | 5 | 5 | 3 | 3 | 0 |
| JAN 29 | 2.23 | 83 | 56 | 40 | 40 | 37 | 28 | 15 | 9 | 5 | 0 | 0 | 0 |
| FEB 5 | 1.80 | 76 | 48 | 34 | 25 | 19 | 17 | 13 | 11 | 7 | 0 | 0 | 0 |
| FEB 12 | 3.40 | 88 | 70 | 61 | 57 | 45 | 40 | 33 | 28 | 21 | 6 | 0 | 0 |
| FEB 19 | 2.15 | 86 | 61 | 42 | 26 | 23 | 21 | 14 | 9 | 3 | 1 | 0 | 0 |
| FEB 26 | (4.58) | 96 | 91 | 82 | 75 | 65 | 48 | 39 | 28 | 21 | 16 | 0 | 0 |
| MAR 5 | 3.27 | 92 | 80 | 67 | 56 | 41 | 32 | 25 | 15 | 6 | 2 | 0 | 0 |
| MAR 12 | 3.66 | 91 | 76 | 67 | 59 | 53 | 44 | 32 | 26 | 18 | 4 | 0 | 0 |
| MAR 19 | 4.92 | 95 | 90 | 82 | 74 | 66 | 52 | 42 | 35 | 28 | 12 | 0 | 0 |
| MAR 26 | 5.14 | 97 | 91 | 80 | 76 | 65 | 53 | 45 | 39 | 30 | 12 | 4 | 0 |
| APR 2 | 3.58 | 95 | 83 | 77 | 66 | 50 | 34 | 18 | 12 | 8 | 8 | 0 | 0 |
| APR 9 | 5.35 | 97 | 91 | 81 | 73 | 66 | 61 | 49 | 43 | 28 | 8 | 0 | 0 |
| APR 16 | 3.66 | 93 | 76 | 62 | 43 | 37 | 30 | 20 | 16 | 12 | 2 | 0 | 0 |
| APR 23 | 3.50 | 93 | 80 | 60 | 52 | 39 | 30 | 23 | 13 | 1 | 0 | 0 | 0 |
| APR 30 | 3.02 | 89 | 67 | 52 | 39 | 25 | 20 | 11 | 8 | 3 | 0 | 0 | 0 |
| MAY 7 | 3.32 | 93 | 80 | 60 | 41 | 36 | 26 | 18 | 14 | 10 | 3 | 0 | 0 |
| MAY 14 | (3.25) | 90 | 47 | 41 | 38 | 32 | 26 | 20 | 14 | 8 | 0 | 0 | 0 |
| MAY 21 | 3.01 | 80 | 68 | 53 | 34 | 27 | 17 | 8 | 6 | 0 | 0 | 0 | 0 |
| MAY 28 | 3.96 | 90 | 70 | 58 | 51 | 46 | 39 | 29 | 18 | 0 | 0 | 0 | 0 |
| JUN 4 | 4.38 | 88 | 79 | 71 | 63 | 53 | 44 | 27 | 11 | 0 | 0 | 0 | 0 |
| JUN 11 | 3.90 | 93 | 83 | 68 | 55 | 49 | 42 | 28 | 17 | 6 | 0 | 0 | 0 |
| JUN 18 | 4.91 | 94 | 91 | 84 | 78 | 68 | 55 | 36 | 8 | 1 | 0 | 0 | 0 |
| JUN 25 | 4.39 | 89 | 78 | 70 | 63 | 56 | 46 | 35 | 16 | 0 | 0 | 0 | 0 |
| JUL 2 | 3.14 | 88 | 64 | 49 | 37 | 28 | 25 | 18 | 10 | 3 | 0 | 0 | 0 |
| JUL 9 | 5.10 | 95 | 91 | 87 | 82 | 72 | 61 | 48 | 24 | 0 | 0 | 0 | 0 |
| JUL 16 | 4.63 | 92 | 83 | 76 | 67 | 55 | 48 | 38 | 30 | 11 | 0 | 0 | 0 |
| JUL 23 | 5.40 | 95 | 92 | 88 | 77 | 69 | 59 | 43 | 27 | 2 | 0 | 0 | 0 |
| JUL 30 | 6.10 | 97 | 95 | 90 | 86 | 81 | 71 | 59 | 45 | 11 | 0 | 0 | 0 |
| AUG 6 | 5.83 | 97 | 95 | 90 | 83 | 77 | 68 | 56 | 42 | 3 | 0 | 0 | 0 |
| AUG 13 | 2.39 | 83 | 64 | 44 | 30 | 17 | 7 | 3 | 0 | 0 | 0 | 0 | 0 |
| AUG 20 | 4.36 | 88 | 78 | 72 | 64 | 55 | 40 | 26 | 16 | 0 | 0 | 0 | 0 |
| AUG 27 | 5.23 | 97 | 92 | 85 | 79 | 73 | 62 | 48 | 29 | 12 | 0 | 0 | 0 |
| SEP 3 | 3.43 | 91 | 79 | 65 | 58 | 42 | 34 | 19 | 11 | 4 | 2 | 0 | 0 |
| SEP 10 | 1.92 | 58 | 42 | 36 | 30 | 22 | 14 | 0 | 0 | 0 | 0 | 0 | 0 |
| SEP 17 | (4.41) | 90 | 74 | 68 | 59 | 54 | 48 | 38 | 32 | 26 | 8 | 4 | 0 |
| SEP 24 | 4.88 | 83 | 80 | 75 | 70 | 66 | 58 | 52 | 41 | 26 | 6 | 0 | 0 |
| OCT 1 | 5.29 | 98 | 93 | 84 | 74 | 69 | 60 | 49 | 35 | 15 | 8 | 0 | 0 |
| OCT 8 | (4.45) | 96 | 83 | 80 | 69 | 54 | 48 | 40 | 27 | 0 | 0 | 0 | 0 |
| OCT 15 | (5.03) | 96 | 92 | 88 | 78 | 70 | 61 | 51 | 40 | 31 | 14 | 4 | 0 |
| OCT 22 | 4.83 | 97 | 93 | 87 | 83 | 76 | 71 | 55 | 44 | 31 | 8 | 0 | 0 |
| OCT 29 | 3.83 | 84 | 69 | 66 | 58 | 51 | 49 | 41 | 36 | 25 | 5 | 1 | 0 |
| NOV 5 | (3.91) | 97 | 94 | 87 | 80 | 70 | 63 | 47 | 24 | 14 | 3 | 3 | 0 |
| NOV 12 | (2.54) | 74 | 56 | 54 | 52 | 45 | 42 | 33 | 19 | 3 | 0 | 0 | 0 |
| NOV 19 | (1.97) | 57 | 51 | 39 | 37 | 37 | 28 | 21 | 15 | 9 | 0 | 0 | 0 |
| NOV 26 | 1.57 | 78 | 61 | 44 | 33 | 21 | 16 | 11 | 6 | 3 | 0 | 0 | 0 |
| DEC 3 | 1.64 | 55 | 37 | 30 | 26 | 23 | 22 | 13 | 6 | 0 | 0 | 0 | 0 |
| DEC 10 | 2.61 | 87 | 76 | 75 | 70 | 60 | 49 | 33 | 18 | 3 | 0 | 0 | 0 |
| DEC 17 | .86 | 58 | 27 | 15 | 10 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 24 | 2.48 | 90 | 71 | 63 | 53 | 47 | 34 | 30 | 16 | 5 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: PLENTYWOOD,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | 4.13 | 96 | 90 | 83 | 73 | 62 | 50 | 38 | 33 | 25 | 14 | 3 | 0 |
| FEB 19 | (4.45) | 96 | 89 | 75 | 65 | 59 | 57 | 51 | 40 | 35 | 15 | 0 | 0 |
| FEB 26 | (5.84) | 97 | 90 | 82 | 76 | 72 | 68 | 66 | 55 | 43 | 28 | 0 | 0 |
| MAR 5 | 5.83 | 97 | 92 | 87 | 80 | 76 | 69 | 60 | 52 | 44 | 31 | 9 | 0 |
| MAR 12 | 3.75 | 81 | 76 | 68 | 59 | 45 | 34 | 32 | 27 | 25 | 19 | 12 | 0 |
| MAR 19 | (4.66) | 97 | 93 | 80 | 73 | 62 | 47 | 32 | 24 | 0 | 0 | 0 | 0 |
| MAR 26 | (3.88) | 93 | 74 | 62 | 56 | 48 | 41 | 34 | 16 | 4 | 0 | 0 | 0 |
| APR 2 | 3.52 | 84 | 69 | 58 | 48 | 42 | 34 | 27 | 21 | 15 | 7 | 0 | 0 |
| APR 9 | 4.12 | 89 | 78 | 63 | 56 | 50 | 46 | 43 | 37 | 26 | 7 | 0 | 0 |
| APR 16 | (2.65) | 54 | 42 | 36 | 34 | 32 | 29 | 26 | 20 | 0 | 0 | 0 | 0 |
| APR 23 | (4.54) | 80 | 73 | 69 | 65 | 60 | 52 | 43 | 24 | 11 | 2 | 0 | 0 |
| APR 30 | 3.25 | 91 | 77 | 61 | 47 | 34 | 22 | 9 | 2 | 0 | 0 | 0 | 0 |
| MAY 7 | (4.07) | 88 | 82 | 71 | 56 | 47 | 38 | 27 | 13 | 8 | 0 | 0 | 0 |
| MAY 14 | 4.19 | 85 | 75 | 67 | 58 | 48 | 38 | 30 | 17 | 5 | 0 | 0 | 0 |
| MAY 21 | (5.25) | 96 | 91 | 84 | 77 | 63 | 51 | 42 | 27 | 2 | 0 | 0 | 0 |
| MAY 28 | (2.89) | 68 | 50 | 39 | 36 | 26 | 21 | 17 | 11 | 5 | 3 | 0 | 0 |
| JUN 4 | 4.58 | 92 | 83 | 73 | 67 | 54 | 44 | 30 | 17 | 2 | 1 | 0 | 0 |
| JUN 11 | (4.45) | 93 | 82 | 71 | 63 | 54 | 45 | 38 | 21 | 5 | 0 | 0 | 0 |
| JUN 18 | 5.06 | 89 | 78 | 75 | 71 | 65 | 57 | 44 | 31 | 7 | 0 | 0 | 0 |
| JUN 25 | 5.56 | 95 | 90 | 86 | 79 | 68 | 61 | 52 | 32 | 7 | 0 | 0 | 0 |
| JUL 2 | (4.27) | 90 | 80 | 68 | 62 | 49 | 39 | 27 | 10 | 2 | 0 | 0 | 0 |
| JUL 9 | 5.56 | 95 | 90 | 85 | 80 | 71 | 64 | 51 | 36 | 7 | 0 | 0 | 0 |
| JUL 16 | 4.32 | 92 | 85 | 77 | 70 | 61 | 43 | 29 | 12 | 4 | 1 | 0 | 0 |
| JUL 23 | 4.34 | 92 | 83 | 72 | 64 | 54 | 47 | 37 | 16 | 0 | 0 | 0 | 0 |
| JUL 30 | 5.37 | 96 | 92 | 87 | 83 | 75 | 71 | 52 | 22 | 4 | 0 | 0 | 0 |
| AUG 6 | 5.60 | 95 | 93 | 89 | 86 | 79 | 72 | 62 | 39 | 1 | 0 | 0 | 0 |
| AUG 13 | 4.42 | 94 | 85 | 75 | 65 | 59 | 43 | 30 | 23 | 13 | 1 | 0 | 0 |
| AUG 20 | 4.50 | 93 | 85 | 75 | 70 | 63 | 55 | 44 | 36 | 25 | 2 | 0 | 0 |
| AUG 27 | (5.64) | 96 | 93 | 89 | 85 | 79 | 67 | 59 | 47 | 33 | 4 | 0 | 0 |
| SEP 3 | 4.43 | 92 | 87 | 80 | 75 | 65 | 55 | 40 | 26 | 11 | 0 | 0 | 0 |
| SEP 10 | (2.53) | 71 | 50 | 47 | 37 | 34 | 25 | 21 | 12 | 0 | 0 | 0 | 0 |
| SEP 17 | | | | | | | | | | | | | |
| SEP 24 | (5.41) | 97 | 93 | 91 | 86 | 81 | 74 | 67 | 55 | 33 | 2 | 0 | 0 |
| OCT 1 | | | | | | | | | | | | | |
| OCT 8 | 5.37 | 97 | 93 | 86 | 81 | 73 | 69 | 62 | 53 | 45 | 20 | 1 | 0 |
| OCT 15 | 4.53 | 97 | 92 | 87 | 79 | 68 | 53 | 42 | 33 | 23 | 8 | 0 | 0 |
| OCT 22 | 3.49 | 93 | 77 | 73 | 68 | 58 | 56 | 45 | 25 | 7 | 3 | 0 | 0 |
| OCT 29 | 4.12 | 96 | 88 | 83 | 75 | 67 | 57 | 44 | 29 | 0 | 0 | 0 | 0 |
| NOV 5 | 2.04 | 74 | 64 | 51 | 46 | 37 | 22 | 14 | 7 | 0 | 0 | 0 | 0 |
| NOV 12 | 2.35 | 77 | 51 | 38 | 37 | 35 | 33 | 30 | 23 | 6 | 0 | 0 | 0 |
| NOV 19 | (1.59) | 71 | 45 | 33 | 25 | 20 | 11 | 6 | 0 | 0 | 0 | 0 | 0 |
| NOV 26 | 3.46 | 89 | 74 | 69 | 66 | 59 | 54 | 48 | 36 | 11 | 0 | 0 | 0 |
| DEC 3 | 3.02 | 92 | 80 | 70 | 61 | 57 | 47 | 34 | 17 | 3 | 0 | 0 | 0 |
| DEC 10 | 2.77 | 87 | 63 | 53 | 49 | 48 | 44 | 36 | 19 | 0 | 0 | 0 | 0 |
| DEC 17 | 1.88 | 92 | 72 | 53 | 41 | 31 | 17 | 13 | 5 | 0 | 0 | 0 | 0 |
| DEC 24 | 1.65 | 76 | 52 | 37 | 27 | 21 | 12 | 7 | 0 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: POLSON, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 1.11 | 79 | 36 | 24 | 16 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAN 8 | 1.17 | 80 | 33 | 27 | 8 | 3 | 3 | 3 | 3 | 3 | 0 | 0 | 0 |
| JAN 15 | 1.17 | 78 | 26 | 13 | 12 | 10 | 6 | 6 | 3 | 0 | 0 | 0 | 0 |
| JAN 22 | 1.90 | 82 | 39 | 30 | 26 | 22 | 21 | 18 | 15 | 10 | 8 | 2 | 0 |
| JAN 29 | 1.94 | 88 | 61 | 34 | 29 | 21 | 18 | 12 | 5 | 5 | 3 | 0 | 0 |
| FEB 5 | 1.88 | 85 | 57 | 41 | 28 | 21 | 13 | 10 | 8 | 8 | 3 | 0 | 0 |
| FEB 12 | 3.60 | 92 | 79 | 61 | 58 | 50 | 44 | 35 | 27 | 21 | 8 | 0 | 0 |
| FEB 19 | 3.15 | 94 | 73 | 50 | 44 | 37 | 30 | 23 | 18 | 12 | 8 | 0 | 0 |
| FEB 26 | 4.55 | 95 | 91 | 81 | 65 | 51 | 44 | 40 | 33 | 27 | 22 | 16 | 1 |
| MAR 5 | 3.85 | 95 | 80 | 64 | 53 | 43 | 34 | 29 | 23 | 17 | 12 | 2 | 0 |
| MAR 12 | 4.28 | 94 | 81 | 66 | 62 | 56 | 45 | 39 | 33 | 21 | 10 | 2 | 0 |
| MAR 19 | 4.93 | 96 | 89 | 80 | 71 | 61 | 59 | 50 | 43 | 27 | 8 | 4 | 4 |
| MAR 26 | 4.77 | 85 | 77 | 74 | 70 | 66 | 59 | 48 | 37 | 28 | 13 | 1 | 0 |
| APR 2 | 3.70 | 95 | 83 | 66 | 55 | 44 | 32 | 23 | 12 | 8 | 5 | 0 | 0 |
| APR 9 | 5.29 | 94 | 88 | 77 | 71 | 64 | 50 | 42 | 30 | 16 | 0 | 0 | 0 |
| APR 16 | 3.59 | 90 | 67 | 57 | 50 | 41 | 34 | 28 | 17 | 10 | 0 | 0 | 0 |
| APR 23 | 3.66 | 90 | 79 | 60 | 51 | 40 | 33 | 23 | 18 | 7 | 0 | 0 | 0 |
| APR 30 | 4.03 | 93 | 82 | 73 | 65 | 45 | 34 | 26 | 15 | 1 | 0 | 0 | 0 |
| MAY 7 | 3.42 | 87 | 74 | 56 | 42 | 31 | 22 | 17 | 12 | 3 | 2 | 0 | 0 |
| MAY 14 | 3.40 | 87 | 65 | 46 | 36 | 30 | 26 | 23 | 18 | 4 | 2 | 0 | 0 |
| MAY 21 | 3.39 | 80 | 71 | 58 | 51 | 42 | 28 | 17 | 12 | 5 | 0 | 0 | 0 |
| MAY 28 | 4.73 | 94 | 79 | 69 | 66 | 57 | 48 | 40 | 25 | 4 | 0 | 0 | 0 |
| JUN 4 | 5.14 | 94 | 88 | 81 | 73 | 66 | 56 | 42 | 27 | 3 | 0 | 0 | 0 |
| JUN 11 | 4.36 | 93 | 85 | 75 | 64 | 53 | 41 | 32 | 17 | 7 | 2 | 0 | 0 |
| JUN 18 | 5.14 | 95 | 90 | 86 | 81 | 74 | 63 | 50 | 28 | 3 | 1 | 0 | 0 |
| JUN 25 | 4.20 | 82 | 74 | 67 | 62 | 57 | 50 | 40 | 24 | 0 | 0 | 0 | 0 |
| JUL 2 | 3.81 | 91 | 81 | 72 | 58 | 45 | 31 | 23 | 14 | 0 | 0 | 0 | 0 |
| JUL 9 | (5.40) | 95 | 92 | 87 | 83 | 77 | 68 | 58 | 33 | 2 | 0 | 0 | 0 |
| JUL 16 | 4.85 | 94 | 88 | 82 | 75 | 63 | 56 | 44 | 29 | 2 | 0 | 0 | 0 |
| JUL 23 | 5.59 | 96 | 92 | 87 | 79 | 71 | 63 | 53 | 33 | 1 | 0 | 0 | 0 |
| JUL 30 | 5.92 | 96 | 94 | 90 | 85 | 80 | 71 | 57 | 38 | 0 | 0 | 0 | 0 |
| AUG 6 | 5.58 | 97 | 93 | 86 | 82 | 73 | 66 | 50 | 31 | 0 | 0 | 0 | 0 |
| AUG 13 | 2.89 | 88 | 68 | 51 | 35 | 25 | 22 | 20 | 14 | 9 | 1 | 0 | 0 |
| AUG 20 | 4.16 | 87 | 79 | 70 | 61 | 54 | 44 | 36 | 23 | 14 | 4 | 0 | 0 |
| AUG 27 | 5.65 | 96 | 92 | 88 | 77 | 71 | 63 | 57 | 45 | 21 | 3 | 0 | 0 |
| SEP 3 | (2.88) | 80 | 49 | 38 | 32 | 26 | 22 | 17 | 15 | 8 | 0 | 0 | 0 |
| SEP 10 | (2.90) | 91 | 70 | 47 | 36 | 31 | 28 | 20 | 17 | 8 | 0 | 0 | 0 |
| SEP 17 | 3.56 | 92 | 74 | 64 | 57 | 48 | 41 | 33 | 27 | 16 | 7 | 0 | 0 |
| SEP 24 | 4.42 | 84 | 78 | 71 | 66 | 60 | 53 | 42 | 37 | 22 | 0 | 0 | 0 |
| OCT 1 | 5.74 | 98 | 93 | 87 | 81 | 76 | 69 | 64 | 53 | 32 | 4 | 0 | 0 |
| OCT 8 | 4.90 | 87 | 85 | 78 | 72 | 68 | 56 | 51 | 41 | 22 | 0 | 0 | 0 |
| OCT 15 | 4.70 | 97 | 93 | 90 | 80 | 69 | 56 | 49 | 36 | 19 | 5 | 0 | 0 |
| OCT 22 | 4.06 | 96 | 85 | 78 | 71 | 64 | 56 | 50 | 31 | 20 | 2 | 0 | 0 |
| OCT 29 | 3.71 | 83 | 76 | 71 | 66 | 62 | 48 | 43 | 38 | 27 | 10 | 0 | 0 |
| NOV 5 | 2.83 | 80 | 72 | 62 | 57 | 49 | 36 | 28 | 17 | 8 | 0 | 0 | 0 |
| NOV 12 | 1.97 | 47 | 40 | 37 | 35 | 32 | 27 | 21 | 16 | 6 | 0 | 0 | 0 |
| NOV 19 | 1.05 | 75 | 26 | 8 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOV 26 | 2.06 | 78 | 61 | 49 | 43 | 36 | 30 | 24 | 13 | 6 | 3 | 3 | 0 |
| DEC 3 | 1.73 | 59 | 41 | 34 | 28 | 27 | 24 | 19 | 13 | 10 | 6 | 0 | 0 |
| DEC 10 | 2.58 | 87 | 73 | 66 | 62 | 55 | 46 | 28 | 16 | 6 | 0 | 0 | 0 |
| DEC 17 | .96 | 50 | 29 | 20 | 18 | 15 | 12 | 12 | 5 | 5 | 0 | 0 | 0 |
| DEC 24 | 2.04 | 80 | 55 | 35 | 34 | 28 | 25 | 23 | 11 | 5 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: REDLODGE,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | (1.05) | 78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FEB 19 | 3.79 | 87 | 75 | 68 | 55 | 51 | 45 | 40 | 29 | 25 | 17 | 1 | 0 |
| FEB 26 | 5.00 | 96 | 86 | 80 | 67 | 61 | 57 | 53 | 43 | 34 | 25 | 12 | 0 |
| MAR 5 | 5.12 | 97 | 92 | 83 | 75 | 65 | 53 | 44 | 31 | 23 | 13 | 2 | 0 |
| MAR 12 | 4.48 | 96 | 90 | 77 | 66 | 59 | 51 | 37 | 28 | 25 | 10 | 2 | 0 |
| MAR 19 | 4.17 | 75 | 62 | 55 | 52 | 47 | 43 | 38 | 31 | 28 | 16 | 1 | 0 |
| MAR 26 | 4.43 | 83 | 74 | 69 | 62 | 56 | 51 | 46 | 39 | 25 | 11 | 0 | 0 |
| APR 2 | (3.66) | 93 | 82 | 70 | 59 | 45 | 33 | 21 | 13 | 8 | 0 | 0 | 0 |
| APR 9 | 4.07 | 86 | 78 | 69 | 67 | 59 | 52 | 44 | 33 | 19 | 3 | 0 | 0 |
| APR 16 | (3.34) | 87 | 70 | 59 | 45 | 33 | 30 | 24 | 20 | 15 | 6 | 0 | 0 |
| APR 23 | 2.74 | 69 | 57 | 51 | 31 | 26 | 22 | 18 | 10 | 4 | 0 | 0 | 0 |
| APR 30 | 2.49 | 83 | 58 | 39 | 23 | 18 | 17 | 16 | 14 | 10 | 2 | 0 | 0 |
| MAY 7 | 4.52 | 93 | 83 | 76 | 66 | 59 | 54 | 37 | 29 | 16 | 2 | 0 | 0 |
| MAY 14 | 3.07 | 73 | 52 | 46 | 41 | 34 | 27 | 15 | 9 | 1 | 0 | 0 | 0 |
| MAY 21 | 4.39 | 94 | 86 | 76 | 64 | 55 | 44 | 30 | 14 | 2 | 0 | 0 | 0 |
| MAY 28 | 3.55 | 85 | 63 | 51 | 46 | 37 | 25 | 15 | 6 | 0 | 0 | 0 | 0 |
| JUN 4 | 3.00 | 88 | 74 | 49 | 31 | 24 | 13 | 8 | 2 | 0 | 0 | 0 | 0 |
| JUN 11 | (2.96) | 91 | 70 | 51 | 21 | 18 | 16 | 10 | 6 | 0 | 0 | 0 | 0 |
| JUN 18 | 4.82 | 91 | 82 | 75 | 69 | 60 | 56 | 47 | 33 | 5 | 0 | 0 | 0 |
| JUN 25 | 4.58 | 92 | 87 | 79 | 70 | 64 | 55 | 46 | 29 | 5 | 0 | 0 | 0 |
| JUL 2 | 3.96 | 91 | 84 | 74 | 57 | 43 | 30 | 22 | 17 | 3 | 0 | 0 | 0 |
| JUL 9 | 4.78 | 89 | 79 | 74 | 67 | 61 | 56 | 44 | 35 | 14 | 1 | 0 | 0 |
| JUL 16 | 3.33 | 76 | 64 | 55 | 44 | 38 | 32 | 23 | 14 | 6 | 0 | 0 | 0 |
| JUL 23 | 4.61 | 92 | 82 | 73 | 69 | 65 | 54 | 43 | 18 | 3 | 0 | 0 | 0 |
| JUL 30 | (4.99) | 87 | 78 | 75 | 70 | 64 | 58 | 50 | 32 | 0 | 0 | 0 | 0 |
| AUG 6 | 5.34 | 94 | 88 | 80 | 74 | 70 | 60 | 51 | 39 | 17 | 0 | 0 | 0 |
| AUG 13 | (3.31) | 85 | 59 | 46 | 39 | 32 | 25 | 21 | 18 | 10 | 0 | 0 | 0 |
| AUG 20 | 4.93 | 97 | 89 | 83 | 74 | 71 | 60 | 48 | 31 | 8 | 0 | 0 | 0 |
| AUG 27 | 4.90 | 96 | 91 | 81 | 70 | 67 | 61 | 48 | 32 | 19 | 0 | 0 | 0 |
| SEP 3 | 4.21 | 93 | 82 | 72 | 63 | 50 | 39 | 29 | 25 | 15 | 3 | 0 | 0 |
| SEP 10 | 3.72 | 78 | 65 | 57 | 49 | 38 | 32 | 27 | 21 | 11 | 0 | 0 | 0 |
| SEP 17 | (5.58) | 98 | 93 | 88 | 80 | 71 | 61 | 50 | 37 | 28 | 10 | 6 | 0 |
| SEP 24 | (5.63) | 97 | 89 | 84 | 80 | 68 | 62 | 56 | 46 | 32 | 14 | 4 | 0 |
| OCT 1 | 6.08 | 98 | 95 | 92 | 87 | 81 | 75 | 66 | 54 | 38 | 9 | 0 | 0 |
| OCT 8 | 5.12 | 97 | 91 | 88 | 81 | 74 | 65 | 55 | 44 | 20 | 0 | 0 | 0 |
| OCT 15 | (4.80) | 96 | 93 | 88 | 81 | 65 | 56 | 47 | 33 | 13 | 0 | 0 | 0 |
| OCT 22 | (4.77) | 97 | 94 | 89 | 82 | 75 | 65 | 58 | 43 | 27 | 2 | 0 | 0 |
| OCT 29 | 5.24 | 97 | 95 | 91 | 88 | 83 | 73 | 62 | 49 | 23 | 4 | 0 | 0 |
| NOV 5 | 2.79 | 91 | 72 | 58 | 50 | 44 | 33 | 16 | 10 | 8 | 0 | 0 | 0 |
| NOV 12 | 3.31 | 83 | 66 | 62 | 52 | 44 | 35 | 26 | 21 | 15 | 6 | 0 | 0 |
| NOV 19 | 3.90 | 94 | 76 | 68 | 62 | 56 | 51 | 42 | 33 | 25 | 7 | 0 | 0 |
| NOV 26 | 2.39 | 90 | 56 | 47 | 40 | 31 | 29 | 26 | 13 | 5 | 0 | 0 | 0 |
| DEC 3 | 3.06 | 91 | 76 | 71 | 62 | 54 | 46 | 34 | 28 | 20 | 2 | 0 | 0 |
| DEC 10 | 3.64 | 95 | 90 | 83 | 74 | 66 | 59 | 51 | 38 | 16 | 0 | 0 | 0 |
| DEC 17 | 2.40 | 91 | 71 | 66 | 52 | 46 | 37 | 27 | 14 | 2 | 0 | 0 | 0 |
| DEC 24 | 3.69 | 97 | 92 | 85 | 75 | 69 | 60 | 54 | 39 | 13 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: SIDNEY,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | (4.77) | 98 | 95 | 89 | 80 | 67 | 50 | 42 | 31 | 23 | 14 | 1 | 0 |
| FEB 19 | 4.65 | 97 | 91 | 77 | 69 | 65 | 58 | 53 | 48 | 40 | 30 | 4 | 0 |
| FEB 26 | (6.01) | 98 | 92 | 84 | 72 | 62 | 57 | 53 | 48 | 42 | 33 | 18 | 0 |
| MAR 5 | 4.09 | 97 | 88 | 76 | 53 | 43 | 38 | 34 | 30 | 23 | 14 | 1 | 0 |
| MAR 12 | (3.36) | 94 | 82 | 66 | 49 | 37 | 27 | 21 | 17 | 13 | 8 | 3 | 1 |
| MAR 19 | 5.45 | 98 | 93 | 87 | 82 | 72 | 63 | 56 | 48 | 37 | 19 | 5 | 2 |
| MAR 26 | 4.47 | 90 | 79 | 70 | 65 | 58 | 49 | 39 | 29 | 17 | 2 | 0 | 0 |
| APR 2 | 4.37 | 94 | 83 | 75 | 67 | 58 | 48 | 42 | 35 | 21 | 9 | 2 | 0 |
| APR 9 | (4.35) | 84 | 73 | 66 | 60 | 57 | 52 | 46 | 38 | 28 | 12 | 1 | 0 |
| APR 16 | 2.49 | 69 | 39 | 34 | 32 | 29 | 26 | 22 | 16 | 11 | 1 | 0 | 0 |
| APR 23 | 3.47 | 87 | 68 | 53 | 41 | 37 | 34 | 30 | 22 | 13 | 2 | 0 | 0 |
| APR 30 | (2.74) | 83 | 50 | 37 | 32 | 27 | 24 | 21 | 17 | 5 | 1 | 0 | 0 |
| MAY 7 | (3.77) | 91 | 75 | 66 | 57 | 51 | 45 | 40 | 31 | 8 | 2 | 0 | 0 |
| MAY 14 | 3.44 | 89 | 76 | 64 | 53 | 44 | 36 | 27 | 16 | 0 | 0 | 0 | 0 |
| MAY 21 | 5.09 | 94 | 89 | 84 | 81 | 76 | 70 | 61 | 38 | 1 | 0 | 0 | 0 |
| MAY 28 | 2.72 | 73 | 51 | 43 | 37 | 31 | 25 | 18 | 11 | 4 | 1 | 0 | 0 |
| JUN 4 | (4.32) | 91 | 81 | 73 | 66 | 62 | 57 | 46 | 25 | 4 | 0 | 0 | 0 |
| JUN 11 | | | | | | | | | | | | | |
| JUN 18 | | | | | | | | | | | | | |
| JUN 25 | | | | | | | | | | | | | |
| JUL 2 | | | | | | | | | | | | | |
| JUL 9 | | | | | | | | | | | | | |
| JUL 16 | | | | | | | | | | | | | |
| JUL 23 | | | | | | | | | | | | | |
| JUL 30 | | | | | | | | | | | | | |
| AUG 6 | | | | | | | | | | | | | |
| AUG 13 | | | | | | | | | | | | | |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | | | | | | | | | | | | | |
| SEP 3 | | | | | | | | | | | | | |
| SEP 10 | | | | | | | | | | | | | |
| SEP 17 | | | | | | | | | | | | | |
| SEP 24 | | | | | | | | | | | | | |
| OCT 1 | | | | | | | | | | | | | |
| OCT 8 | | | | | | | | | | | | | |
| OCT 15 | | | | | | | | | | | | | |
| OCT 22 | | | | | | | | | | | | | |
| OCT 29 | | | | | | | | | | | | | |
| NOV 5 | | | | | | | | | | | | | |
| NOV 12 | (4.05) | 83 | 77 | 74 | 71 | 65 | 61 | 50 | 41 | 24 | 0 | 0 | 0 |
| NOV 19 | 2.25 | 75 | 48 | 38 | 36 | 33 | 30 | 24 | 13 | 8 | 0 | 0 | 0 |
| NOV 26 | ( .89) | 81 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 3 | 2.62 | 91 | 76 | 62 | 47 | 43 | 34 | 19 | 12 | 0 | 0 | 0 | 0 |
| DEC 10 | 2.58 | 81 | 71 | 64 | 54 | 47 | 37 | 27 | 10 | 0 | 0 | 0 | 0 |
| DEC 17 | 1.30 | 75 | 48 | 29 | 25 | 14 | 5 | 3 | 0 | 0 | 0 | 0 | 0 |
| DEC 24 | 1.58 | 62 | 41 | 32 | 28 | 23 | 16 | 9 | 0 | 0 | 0 | 0 | 0 |

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | | | | | | | | | | | | | |
| JAN 8 | | | | | | | | | | | | | |
| JAN 15 | | | | | | | | | | | | | |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | | | | | | | | | | | | | |
| FEB 5 | | | | | | | | | | | | | |
| FEB 12 | (2.05) | 54 | 44 | 42 | 40 | 35 | 31 | 26 | 22 | 8 | 0 | 0 | 0 |
| FEB 19 | (2.35) | 74 | 49 | 40 | 34 | 30 | 24 | 19 | 17 | 14 | 4 | 0 | 0 |
| FEB 26 | (3.70) | 94 | 86 | 69 | 56 | 47 | 39 | 33 | 27 | 18 | 8 | 0 | 0 |
| MAR 5 | 2.19 | 81 | 49 | 33 | 26 | 20 | 16 | 14 | 10 | 6 | 2 | 1 | 0 |
| MAR 12 | (3.07) | 91 | 67 | 54 | 47 | 41 | 36 | 31 | 27 | 21 | 14 | 7 | 0 |
| MAR 19 | (4.02) | 92 | 78 | 69 | 58 | 53 | 48 | 41 | 33 | 26 | 11 | 2 | 0 |
| MAR 26 | 3.63 | 89 | 70 | 58 | 49 | 45 | 40 | 36 | 31 | 24 | 12 | 3 | 0 |
| APR 2 | 2.82 | 91 | 73 | 55 | 42 | 32 | 24 | 19 | 14 | 4 | 0 | 0 | 0 |
| APR 9 | (4.54) | 96 | 86 | 76 | 69 | 62 | 49 | 35 | 19 | 13 | 2 | 0 | 0 |
| APR 16 | (4.27) | 95 | 87 | 72 | 57 | 49 | 40 | 32 | 21 | 7 | 0 | 0 | 0 |
| APR 23 | (2.98) | 86 | 69 | 57 | 47 | 38 | 30 | 22 | 13 | 5 | 3 | 1 | 0 |
| APR 30 | 3.75 | 94 | 80 | 67 | 54 | 45 | 37 | 29 | 19 | 9 | 2 | 0 | 0 |
| MAY 7 | 3.13 | 90 | 61 | 47 | 42 | 38 | 34 | 27 | 18 | 7 | 1 | 0 | 0 |
| MAY 14 | 3.06 | 89 | 61 | 40 | 34 | 30 | 25 | 20 | 14 | 8 | 0 | 0 | 0 |
| MAY 21 | 3.12 | 89 | 63 | 47 | 41 | 35 | 30 | 26 | 21 | 14 | 9 | 1 | 5 |
| MAY 28 | 4.54 | 93 | 80 | 70 | 56 | 48 | 43 | 35 | 26 | 6 | 4 | 0 | 0 |
| JUN 4 | (5.43) | 95 | 93 | 89 | 79 | 70 | 56 | 42 | 25 | 2 | 0 | 0 | 0 |
| JUN 11 | (3.33) | 91 | 70 | 60 | 50 | 31 | 24 | 18 | 12 | 3 | 0 | 0 | 0 |
| JUN 18 | (5.18) | 94 | 91 | 84 | 71 | 65 | 55 | 44 | 30 | 10 | 0 | 0 | 0 |
| JUN 25 | 4.21 | 84 | 75 | 63 | 59 | 53 | 45 | 37 | 27 | 1 | 0 | 0 | 0 |
| JUL 2 | 3.72 | 88 | 78 | 64 | 51 | 41 | 33 | 28 | 11 | 4 | 0 | 0 | 0 |
| JUL 9 | 4.39 | 92 | 85 | 77 | 69 | 61 | 50 | 37 | 16 | 0 | 0 | 0 | 0 |
| JUL 16 | 4.22 | 87 | 71 | 63 | 56 | 50 | 44 | 38 | 26 | 0 | 0 | 0 | 0 |
| JUL 23 | (5.06) | 95 | 90 | 84 | 72 | 61 | 49 | 39 | 24 | 3 | 0 | 0 | 0 |
| JUL 30 | (6.68) | 97 | 95 | 93 | 90 | 82 | 76 | 69 | 54 | 27 | 11 | 0 | 0 |
| AUG 6 | (3.73) | 94 | 76 | 66 | 54 | 38 | 25 | 19 | 12 | 0 | 0 | 0 | 0 |
| AUG 13 | (2.68) | 65 | 55 | 47 | 39 | 33 | 29 | 21 | 17 | 9 | 0 | 0 | 0 |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | | | | | | | | | | | | | |
| SEP 3 | | | | | | | | | | | | | |
| SEP 10 | | | | | | | | | | | | | |
| SEP 17 | | | | | | | | | | | | | |
| SEP 24 | | | | | | | | | | | | | |
| OCT 1 | (5.55) | 97 | 94 | 91 | 86 | 76 | 67 | 56 | 43 | 21 | 0 | 0 | 0 |
| OCT 8 | 5.00 | 91 | 81 | 78 | 75 | 69 | 62 | 55 | 45 | 27 | 3 | 0 | 0 |
| OCT 15 | 4.70 | 96 | 93 | 88 | 80 | 72 | 62 | 47 | 28 | 11 | 0 | 0 | 0 |
| OCT 22 | 3.66 | 93 | 84 | 76 | 73 | 68 | 53 | 40 | 23 | 4 | 0 | 0 | 0 |
| OCT 29 | 2.69 | 83 | 63 | 54 | 48 | 40 | 34 | 30 | 14 | 4 | 0 | 0 | 0 |
| NOV 5 | 2.29 | 74 | 54 | 39 | 34 | 32 | 25 | 17 | 11 | 4 | 0 | 0 | 0 |
| NOV 12 | 2.26 | 59 | 52 | 47 | 43 | 38 | 32 | 21 | 13 | 0 | 0 | 0 | 0 |
| NOV 19 | 1.34 | 53 | 29 | 20 | 16 | 12 | 11 | 9 | 7 | 5 | 0 | 0 | 0 |
| NOV 26 | 1.56 | 71 | 52 | 39 | 33 | 27 | 20 | 14 | 9 | 6 | 0 | 0 | 0 |
| DEC 3 | (2.22) | 89 | 86 | 70 | 66 | 57 | 52 | 44 | 9 | 0 | 0 | 0 | 0 |
| DEC 10 | 2.19 | 61 | 46 | 42 | 41 | 32 | 32 | 26 | 17 | 10 | 3 | 0 | 0 |
| DEC 17 | .99 | 53 | 32 | 26 | 22 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEC 24 | .89 | 24 | 13 | 13 | 12 | 12 | 11 | 9 | 6 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: WEST YELLOWSTONE, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| WEEK STARTING | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
| JAN 1 | 1.29 | 78 | 44 | 17 | 13 | 11 | 9 | 7 | 7 | 3 | 0 | 0 | 0 |
| JAN 8 | 1.21 | 73 | 36 | 23 | 14 | 11 | 11 | 8 | 2 | 2 | 0 | 0 | 0 |
| JAN 15 | (1.95) | 77 | 31 | 31 | 31 | 29 | 29 | 27 | 24 | 20 | 8 | 4 | 0 |
| JAN 22 | | | | | | | | | | | | | |
| JAN 29 | (1.97) | 94 | 68 | 46 | 29 | 21 | 21 | 21 | 8 | 8 | 0 | 0 | 0 |
| FEB 5 | 1.60 | 80 | 40 | 28 | 19 | 17 | 12 | 9 | 8 | 2 | 0 | 0 | 0 |
| FEB 12 | 4.98 | 96 | 88 | 84 | 76 | 70 | 65 | 52 | 48 | 36 | 31 | 12 | 0 |
| FEB 19 | 3.72 | 95 | 86 | 71 | 60 | 52 | 47 | 41 | 26 | 24 | 16 | 7 | 0 |
| FEB 26 | 4.22 | 93 | 80 | 74 | 66 | 58 | 49 | 39 | 33 | 25 | 13 | 3 | 0 |
| MAR 5 | 3.90 | 95 | 85 | 70 | 60 | 53 | 47 | 39 | 31 | 25 | 13 | 7 | 0 |
| MAR 12 | 4.40 | 96 | 85 | 75 | 66 | 56 | 45 | 34 | 25 | 14 | 5 | 0 | 0 |
| MAR 19 | 5.01 | 95 | 84 | 74 | 68 | 63 | 56 | 49 | 37 | 24 | 13 | 2 | 0 |
| MAR 26 | 5.78 | 97 | 93 | 85 | 80 | 75 | 64 | 56 | 49 | 35 | 15 | 2 | 0 |
| APR 2 | 3.56 | 95 | 86 | 72 | 57 | 42 | 30 | 26 | 21 | 14 | 4 | 0 | 0 |
| APR 9 | 5.14 | 95 | 88 | 79 | 72 | 63 | 54 | 44 | 35 | 26 | 9 | 4 | 0 |
| APR 16 | 4.65 | 95 | 87 | 77 | 67 | 59 | 49 | 33 | 23 | 17 | 5 | 1 | 0 |
| APR 23 | 3.87 | 94 | 86 | 69 | 50 | 34 | 29 | 19 | 16 | 6 | 0 | 0 | 0 |
| APR 30 | 3.60 | 93 | 79 | 60 | 48 | 37 | 33 | 28 | 20 | 6 | 2 | 0 | 0 |
| MAY 7 | 4.19 | 94 | 85 | 75 | 61 | 48 | 33 | 20 | 15 | 5 | 1 | 0 | 0 |
| MAY 14 | 3.30 | 86 | 67 | 47 | 37 | 28 | 26 | 18 | 9 | 0 | 0 | 0 | 0 |
| MAY 21 | 4.17 | 94 | 84 | 74 | 64 | 51 | 43 | 23 | 9 | 2 | 0 | 0 | 0 |
| MAY 28 | 3.49 | 90 | 78 | 61 | 46 | 36 | 26 | 15 | 7 | 4 | 0 | 0 | 0 |
| JUN 4 | 4.57 | 92 | 81 | 70 | 61 | 52 | 47 | 37 | 17 | 1 | 0 | 0 | 0 |
| JUN 11 | 4.54 | 93 | 86 | 77 | 67 | 62 | 50 | 31 | 8 | 1 | 0 | 0 | 0 |
| JUN 18 | 4.86 | 95 | 91 | 84 | 78 | 68 | 59 | 42 | 10 | 1 | 0 | 0 | 0 |
| JUN 25 | 4.89 | 93 | 89 | 80 | 74 | 61 | 48 | 35 | 11 | 3 | 0 | 0 | 0 |
| JUL 2 | 4.15 | 92 | 79 | 68 | 58 | 48 | 38 | 26 | 10 | 0 | 0 | 0 | 0 |
| JUL 9 | 4.87 | 95 | 90 | 83 | 69 | 57 | 49 | 36 | 18 | 0 | 0 | 0 | 0 |
| JUL 16 | (4.32) | 94 | 88 | 77 | 68 | 59 | 48 | 35 | 18 | 0 | 0 | 0 | 0 |
| JUL 23 | (5.28) | 95 | 89 | 85 | 78 | 70 | 62 | 51 | 31 | 3 | 0 | 0 | 0 |
| JUL 30 | | | | | | | | | | | | | |
| AUG 6 | | | | | | | | | | | | | |
| AUG 13 | | | | | | | | | | | | | |
| AUG 20 | | | | | | | | | | | | | |
| AUG 27 | | | | | | | | | | | | | |
| SEP 3 | | | | | | | | | | | | | |
| SEP 10 | (6.54) | 98 | 95 | 90 | 89 | 84 | 79 | 72 | 66 | 53 | 20 | 0 | 0 |
| SEP 17 | 5.42 | 95 | 82 | 78 | 74 | 70 | 63 | 55 | 44 | 30 | 13 | 3 | 0 |
| SEP 24 | 5.93 | 97 | 92 | 85 | 80 | 72 | 66 | 59 | 47 | 36 | 7 | 0 | 0 |
| OCT 1 | 6.56 | 99 | 96 | 93 | 90 | 83 | 77 | 68 | 58 | 39 | 12 | 0 | 0 |
| OCT 8 | 6.24 | 98 | 95 | 91 | 88 | 82 | 74 | 65 | 53 | 35 | 5 | 0 | 0 |
| OCT 15 | 5.17 | 98 | 92 | 87 | 79 | 73 | 65 | 54 | 44 | 34 | 16 | 0 | 0 |
| OCT 22 | 5.79 | 98 | 95 | 91 | 86 | 76 | 72 | 62 | 52 | 38 | 13 | 0 | 0 |
| OCT 29 | 4.69 | 92 | 89 | 85 | 81 | 74 | 68 | 53 | 45 | 31 | 6 | 0 | 0 |
| NOV 5 | 2.32 | 66 | 49 | 44 | 37 | 29 | 23 | 20 | 13 | 11 | 0 | 0 | 0 |
| NOV 12 | 2.54 | 75 | 55 | 46 | 42 | 38 | 35 | 33 | 32 | 24 | 12 | 0 | 0 |
| NOV 19 | 2.28 | 82 | 58 | 46 | 38 | 31 | 25 | 20 | 17 | 12 | 5 | 0 | 0 |
| NOV 26 | 2.81 | 92 | 74 | 60 | 52 | 44 | 41 | 34 | 23 | 13 | 3 | 0 | 0 |
| DEC 3 | 3.05 | 80 | 66 | 52 | 49 | 46 | 42 | 32 | 21 | 9 | 2 | 0 | 0 |
| DEC 10 | 3.54 | 86 | 78 | 69 | 61 | 53 | 45 | 39 | 32 | 20 | 5 | 0 | 0 |
| DEC 17 | 1.37 | 53 | 40 | 33 | 30 | 17 | 13 | 12 | 8 | 4 | 0 | 0 | 0 |
| DEC 24 | 2.85 | 80 | 58 | 48 | 46 | 41 | 38 | 31 | 24 | 14 | 4 | 0 | 0 |

SOLAR RADIATION DATA for: ANACONDA,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | | | | | | | | | | | | | |
| MAR | (5.05) | 97 | 93 | 87 | 82 | 78 | 70 | 63 | 54 | 24 | 3 | 0 | 0 |
| APR | (3.92) | 91 | 78 | 68 | 56 | 45 | 37 | 30 | 21 | 11 | 2 | 0 | 0 |
| MAY | 3.26 | 83 | 65 | 47 | 39 | 33 | 26 | 21 | 16 | 4 | 0 | 0 | 0 |
| JUN | (4.21) | 91 | 83 | 71 | 61 | 50 | 37 | 26 | 12 | 2 | 0 | 0 | 0 |
| JUL | (4.77) | 93 | 85 | 79 | 67 | 59 | 50 | 40 | 28 | 12 | 2 | 1 | 0 |
| AUG | (4.40) | 95 | 90 | 83 | 74 | 64 | 53 | 48 | 30 | 14 | 0 | 0 | 0 |
| SEP | 4.19 | 88 | 75 | 69 | 62 | 54 | 46 | 40 | 29 | 21 | 7 | 1 | 0 |
| OCT | (5.31) | 97 | 94 | 88 | 83 | 77 | 67 | 59 | 48 | 34 | 16 | 1 | 0 |
| NOV | (2.43) | 81 | 60 | 47 | 40 | 35 | 29 | 22 | 16 | 9 | 0 | 0 | 0 |
| DEC | (2.13) | 83 | 63 | 54 | 44 | 34 | 24 | 17 | 9 | 1 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: BILLINGS,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 2.70 | 89 | 66 | 50 | 45 | 36 | 31 | 24 | 18 | 10 | 2 | 0 | 0 |
| FEB | 3.59 | 91 | 69 | 58 | 54 | 46 | 42 | 36 | 28 | 20 | 11 | 0 | 0 |
| MAR | 4.92 | 93 | 86 | 78 | 71 | 63 | 52 | 45 | 34 | 23 | 8 | 1 | 0 |
| APR | (3.92) | 87 | 74 | 64 | 58 | 51 | 41 | 33 | 23 | 11 | 3 | 0 | 0 |
| MAY | 3.60 | 81 | 66 | 56 | 50 | 45 | 37 | 30 | 19 | 4 | 1 | 0 | 0 |
| JUN | 4.65 | 93 | 88 | 82 | 75 | 67 | 56 | 44 | 18 | 1 | 0 | 0 | 0 |
| JUL | 4.20 | 89 | 80 | 72 | 63 | 54 | 46 | 35 | 13 | 0 | 0 | 0 | 0 |
| AUG | 5.10 | 95 | 90 | 84 | 77 | 70 | 61 | 51 | 35 | 10 | 0 | 0 | 0 |
| SEP | (4.68) | 89 | 83 | 76 | 70 | 62 | 55 | 46 | 33 | 18 | 2 | 0 | 0 |
| OCT | (5.07) | 97 | 95 | 89 | 84 | 78 | 70 | 61 | 42 | 27 | 4 | 0 | 0 |
| NOV | 3.39 | 87 | 72 | 60 | 55 | 47 | 39 | 33 | 25 | 16 | 2 | 0 | 0 |
| DEC | 2.95 | 88 | 78 | 68 | 63 | 52 | 44 | 34 | 23 | 13 | 1 | 0 | 0 |

SOLAR RADIATION DATA for: BOZEMAN,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 2.53 | 84 | 65 | 51 | 43 | 36 | 32 | 26 | 21 | 14 | 7 | 1 | 0 |
| FEB | (3.81) | 95 | 82 | 69 | 59 | 53 | 46 | 40 | 34 | 24 | 17 | 4 | 1 |
| MAR | (4.98) | 96 | 91 | 83 | 71 | 65 | 55 | 47 | 38 | 27 | 12 | 2 | 0 |
| APR | 4.02 | 93 | 82 | 65 | 55 | 47 | 36 | 28 | 21 | 12 | 3 | 0 | 0 |
| MAY | (3.75) | 89 | 73 | 61 | 51 | 42 | 33 | 24 | 15 | 4 | 0 | 0 | 0 |
| JUN | (4.45) | 91 | 83 | 75 | 68 | 60 | 48 | 32 | 12 | 1 | 0 | 0 | 0 |
| JUL | 4.65 | 94 | 86 | 78 | 69 | 63 | 52 | 39 | 24 | 2 | 0 | 0 | 0 |
| AUG | 5.00 | 94 | 87 | 77 | 71 | 65 | 56 | 46 | 34 | 12 | 2 | 0 | 0 |
| SEP | 4.51 | 87 | 78 | 72 | 67 | 62 | 54 | 46 | 38 | 23 | 5 | 1 | 0 |
| OCT | 5.24 | 95 | 91 | 86 | 80 | 72 | 64 | 55 | 45 | 33 | 5 | 0 | 0 |
| NOV | (2.92) | 79 | 66 | 53 | 47 | 42 | 32 | 25 | 19 | 12 | 3 | 0 | 0 |
| DEC | (2.35) | 72 | 57 | 50 | 45 | 43 | 37 | 31 | 22 | 18 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: BROWNING,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (3.04) | 89 | 70 | 56 | 48 | 41 | 35 | 29 | 23 | 16 | 5 | 0 | 0 |
| FEB | (4.05) | 89 | 79 | 63 | 54 | 47 | 42 | 38 | 32 | 25 | 16 | 1 | 0 |
| MAR | (4.14) | 90 | 81 | 72 | 63 | 52 | 45 | 37 | 30 | 21 | 12 | 5 | 1 |
| APR | 3.64 | 87 | 66 | 55 | 48 | 40 | 34 | 28 | 19 | 11 | 4 | 0 | 0 |
| MAY | (4.03) | 87 | 71 | 61 | 54 | 44 | 38 | 32 | 23 | 10 | 1 | 0 | 0 |
| JUN | 5.24 | 94 | 87 | 83 | 77 | 69 | 59 | 45 | 26 | 1 | 0 | 0 | 0 |
| JUL | 4.65 | 91 | 81 | 73 | 65 | 57 | 51 | 42 | 29 | 5 | 0 | 0 | 0 |
| AUG | (4.77) | 93 | 83 | 75 | 68 | 59 | 52 | 42 | 32 | 14 | 3 | 0 | 0 |
| SEP | 4.90 | 90 | 82 | 76 | 70 | 65 | 58 | 47 | 37 | 27 | 7 | 1 | 0 |
| OCT | 4.60 | 92 | 84 | 81 | 73 | 65 | 55 | 43 | 33 | 21 | 4 | 0 | 0 |
| NOV | (4.81) | 98 | 95 | 90 | 90 | 80 | 71 | 64 | 43 | 12 | 0 | 0 | 0 |
| DEC | (3.55) | 98 | 95 | 95 | 81 | 60 | 45 | 10 | 0 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: BUTTE,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (2.43) | 87 | 59 | 45 | 38 | 34 | 27 | 22 | 17 | 11 | 2 | 0 | 0 |
| FEB | 3.67 | 93 | 76 | 67 | 60 | 53 | 43 | 37 | 28 | 19 | 8 | 1 | 0 |
| MAR | (4.92) | 96 | 88 | 81 | 71 | 64 | 56 | 49 | 40 | 28 | 9 | 1 | 0 |
| APR | 4.15 | 94 | 82 | 70 | 60 | 50 | 40 | 30 | 22 | 12 | 6 | 1 | 0 |
| MAY | (3.36) | 90 | 70 | 52 | 41 | 34 | 27 | 21 | 13 | 5 | 0 | 0 | 0 |
| JUN | | | | | | | | | | | | | |
| JUL | | | | | | | | | | | | | |
| AUG | | | | | | | | | | | | | |
| SEP | | | | | | | | | | | | | |
| OCT | (4.21) | 90 | 73 | 65 | 60 | 51 | 50 | 45 | 36 | 30 | 3 | 0 | 0 |
| NOV | 2.84 | 83 | 64 | 56 | 51 | 44 | 38 | 29 | 22 | 13 | 2 | 0 | 0 |
| DEC | 2.69 | 84 | 64 | 56 | 51 | 45 | 37 | 31 | 24 | 16 | 2 | 0 | 0 |

SOLAR RADIATION DATA for: CHOTEAU,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | | | | | | | | | | | | | |
| MAR | (3.97) | 86 | 71 | 63 | 55 | 50 | 46 | 40 | 32 | 23 | 13 | 3 | 0 |
| APR | (4.24) | 92 | 74 | 62 | 53 | 47 | 41 | 35 | 30 | 23 | 12 | 2 | 0 |
| MAY | (4.00) | 89 | 73 | 63 | 53 | 46 | 40 | 33 | 27 | 15 | 2 | 0 | 0 |
| JUN | 4.90 | 95 | 88 | 79 | 71 | 63 | 53 | 41 | 24 | 5 | 1 | 0 | 0 |
| JUL | 4.54 | 92 | 80 | 73 | 66 | 58 | 51 | 42 | 25 | 5 | 0 | 0 | 0 |
| AUG | (4.91) | 94 | 83 | 76 | 68 | 62 | 53 | 43 | 33 | 12 | 2 | 0 | 0 |
| SEP | (4.29) | 80 | 72 | 67 | 62 | 55 | 50 | 41 | 32 | 18 | 1 | 0 | 0 |
| OCT | 4.58 | 93 | 84 | 78 | 71 | 63 | 54 | 42 | 31 | 17 | 1 | 0 | 0 |
| NOV | (2.48) | 74 | 54 | 50 | 44 | 37 | 34 | 28 | 22 | 10 | 0 | 0 | 0 |
| DEC | 2.63 | 87 | 68 | 61 | 54 | 47 | 37 | 29 | 22 | 4 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: COLSTRIP,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | | | | | | | | | | | | | |
| MAR | (4.94) | 95 | 88 | 78 | 68 | 62 | 55 | 48 | 39 | 26 | 8 | 0 | 0 |
| APR | 4.25 | 86 | 73 | 66 | 57 | 50 | 44 | 36 | 26 | 17 | 3 | 0 | 0 |
| MAY | (4.05) | 82 | 71 | 62 | 55 | 50 | 44 | 34 | 20 | 2 | 0 | 0 | 0 |
| JUN | 4.70 | 93 | 86 | 78 | 71 | 64 | 55 | 41 | 18 | 3 | 0 | 0 | 0 |
| JUL | (4.56) | 92 | 83 | 73 | 66 | 57 | 50 | 38 | 20 | 1 | 0 | 0 | 0 |
| AUG | 5.16 | 93 | 88 | 82 | 75 | 68 | 60 | 50 | 34 | 11 | 0 | 0 | 0 |
| SEP | (5.86) | 97 | 94 | 91 | 86 | 79 | 71 | 61 | 45 | 28 | 3 | 0 | 0 |
| OCT | 4.96 | 92 | 87 | 82 | 76 | 70 | 61 | 52 | 39 | 28 | 5 | 0 | 0 |
| NOV | (3.54) | 88 | 75 | 61 | 53 | 44 | 40 | 32 | 26 | 17 | 4 | 0 | 0 |
| DEC | (2.53) | 89 | 69 | 56 | 45 | 36 | 31 | 21 | 18 | 10 | 2 | 0 | 0 |

SOLAR RADIATION DATA for: DILLON,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (2.39) | 83 | 67 | 53 | 45 | 36 | 32 | 22 | 17 | 8 | 1 | 0 | 0 |
| FEB | 4.37 | 91 | 79 | 73 | 68 | 62 | 56 | 48 | 40 | 29 | 19 | 1 | 0 |
| MAR | (5.35) | 96 | 92 | 84 | 79 | 72 | 64 | 56 | 45 | 34 | 17 | 1 | 0 |
| APR | (4.64) | 94 | 84 | 73 | 62 | 52 | 45 | 38 | 31 | 23 | 8 | 0 | 0 |
| MAY | 3.87 | 91 | 81 | 68 | 51 | 43 | 35 | 24 | 14 | 5 | 1 | 0 | 0 |
| JUN | 5.13 | 94 | 90 | 82 | 75 | 67 | 55 | 42 | 22 | 3 | 0 | 0 | 0 |
| JUL | (4.71) | 94 | 88 | 80 | 69 | 60 | 49 | 37 | 21 | 2 | 0 | 0 | 0 |
| AUG | (4.72) | 95 | 88 | 81 | 68 | 61 | 51 | 38 | 23 | 9 | 0 | 0 | 0 |
| SEP | (5.38) | 96 | 92 | 83 | 77 | 71 | 65 | 56 | 41 | 30 | 11 | 1 | 0 |
| OCT | 5.92 | 98 | 96 | 91 | 86 | 80 | 72 | 63 | 51 | 35 | 14 | 0 | 0 |
| NOV | (3.78) | 88 | 76 | 68 | 61 | 57 | 51 | 43 | 36 | 26 | 13 | 0 | 0 |
| DEC | 3.34 | 91 | 77 | 69 | 65 | 60 | 54 | 44 | 36 | 24 | 6 | 0 | 0 |

SOLAR RADIATION DATA for: ENNIS,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (4.90) | 95 | 87 | 78 | 68 | 63 | 57 | 54 | 49 | 39 | 27 | 6 | 0 |
| MAR | 5.19 | 97 | 91 | 84 | 76 | 68 | 59 | 48 | 40 | 27 | 13 | 2 | 0 |
| APR | (4.53) | 93 | 84 | 75 | 62 | 53 | 46 | 37 | 29 | 21 | 9 | 3 | 0 |
| MAY | (4.03) | 89 | 79 | 66 | 55 | 43 | 36 | 24 | 17 | 6 | 0 | 0 | 0 |
| JUN | (4.62) | 91 | 83 | 74 | 66 | 58 | 48 | 39 | 25 | 4 | 0 | 0 | 0 |
| JUL | (3.86) | 98 | 94 | 90 | 84 | 73 | 60 | 40 | 10 | 3 | 0 | 0 | 0 |
| AUG | | | | | | | | | | | | | |
| SEP | (6.42) | 99 | 96 | 94 | 85 | 76 | 68 | 63 | 51 | 33 | 0 | 0 | 0 |
| OCT | 5.34 | 96 | 91 | 84 | 79 | 75 | 66 | 58 | 48 | 33 | 5 | 0 | 0 |
| NOV | (2.64) | 87 | 58 | 46 | 41 | 37 | 32 | 26 | 21 | 14 | 3 | 1 | 0 |
| DEC | (2.81) | 88 | 71 | 63 | 54 | 48 | 39 | 33 | 25 | 13 | 1 | 0 | 0 |

SOLAR RADIATION DATA for: FORT BENTON,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (3.88) | 94 | 82 | 77 | 66 | 57 | 51 | 45 | 31 | 20 | 6 | 0 | 0 |
| MAR | (4.25) | 95 | 84 | 73 | 62 | 55 | 49 | 41 | 30 | 18 | 8 | 0 | 0 |
| APR | (3.62) | 90 | 69 | 59 | 53 | 47 | 37 | 28 | 17 | 11 | 3 | 0 | 0 |
| MAY | 3.52 | 84 | 70 | 60 | 51 | 41 | 32 | 26 | 16 | 5 | 0 | 0 | 0 |
| JUN | (4.82) | 93 | 87 | 81 | 73 | 62 | 52 | 40 | 13 | 1 | 0 | 0 | 0 |
| JUL | (5.51) | 95 | 91 | 82 | 78 | 70 | 63 | 49 | 34 | 3 | 0 | 0 | 0 |
| AUG | 5.14 | 94 | 87 | 79 | 73 | 66 | 59 | 46 | 32 | 11 | 1 | 0 | 0 |
| SEP | (4.05) | 83 | 75 | 68 | 62 | 55 | 47 | 38 | 31 | 17 | 1 | 0 | 0 |
| OCT | (4.25) | 90 | 83 | 77 | 70 | 62 | 55 | 44 | 33 | 18 | 2 | 0 | 0 |
| NOV | (2.82) | 80 | 66 | 52 | 45 | 39 | 34 | 28 | 20 | 6 | 0 | 0 | 0 |
| DEC | (1.77) | 85 | 71 | 54 | 47 | 37 | 26 | 9 | 0 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: GLASGOW,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (3.25) | 94 | 80 | 63 | 55 | 48 | 41 | 32 | 25 | 13 | 1 | 0 | 0 |
| FEB | 3.75 | 94 | 79 | 62 | 51 | 43 | 37 | 32 | 27 | 21 | 13 | 5 | 0 |
| MAR | 4.45 | 95 | 85 | 71 | 60 | 53 | 44 | 38 | 30 | 20 | 6 | 0 | 0 |
| APR | (3.77) | 82 | 64 | 56 | 50 | 42 | 37 | 31 | 25 | 18 | 7 | 1 | 0 |
| MAY | 4.28 | 90 | 77 | 64 | 56 | 49 | 40 | 31 | 20 | 5 | 0 | 0 | 0 |
| JUN | (4.95) | 93 | 86 | 78 | 70 | 62 | 53 | 41 | 23 | 1 | 0 | 0 | 0 |
| JUL | (5.09) | 91 | 83 | 77 | 70 | 64 | 54 | 43 | 27 | 4 | 0 | 0 | 0 |
| AUG | (5.08) | 94 | 87 | 80 | 72 | 64 | 55 | 43 | 29 | 9 | 1 | 0 | 0 |
| SEP | (5.07) | 86 | 80 | 75 | 71 | 63 | 57 | 49 | 38 | 23 | 6 | 1 | 0 |
| OCT | (4.86) | 91 | 85 | 78 | 74 | 66 | 57 | 46 | 37 | 25 | 12 | 1 | 0 |
| NOV | (3.01) | 88 | 67 | 58 | 52 | 45 | 39 | 33 | 26 | 16 | 8 | 0 | 0 |
| DEC | (2.89) | 91 | 70 | 60 | 55 | 49 | 44 | 35 | 24 | 12 | 3 | 0 | 0 |

SOLAR RADIATION DATA for: GLENDIVE,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (3.04) | 92 | 75 | 61 | 51 | 46 | 38 | 32 | 25 | 12 | 0 | 0 | 0 |
| FEB | 3.23 | 92 | 73 | 54 | 45 | 40 | 36 | 30 | 24 | 15 | 4 | 0 | 0 |
| MAR | (4.09) | 93 | 77 | 63 | 57 | 49 | 44 | 32 | 23 | 15 | 6 | 0 | 0 |
| APR | 3.55 | 81 | 66 | 57 | 48 | 41 | 34 | 27 | 19 | 12 | 1 | 0 | 0 |
| MAY | 3.56 | 83 | 67 | 56 | 48 | 39 | 32 | 21 | 12 | 1 | 0 | 0 | 0 |
| JUN | (4.71) | 93 | 85 | 76 | 68 | 59 | 50 | 38 | 16 | 1 | 0 | 0 | 0 |
| JUL | (4.73) | 93 | 86 | 78 | 70 | 60 | 49 | 35 | 15 | 1 | 0 | 0 | 0 |
| AUG | (6.21) | 97 | 94 | 92 | 87 | 82 | 74 | 66 | 43 | 9 | 0 | 0 | 0 |
| SEP | (5.52) | 95 | 91 | 86 | 81 | 75 | 66 | 54 | 39 | 21 | 2 | 0 | 0 |
| OCT | 4.05 | 91 | 83 | 77 | 71 | 63 | 55 | 44 | 27 | 13 | 0 | 0 | 0 |
| NOV | (2.63) | 81 | 57 | 49 | 46 | 37 | 32 | 24 | 16 | 8 | 0 | 0 | 0 |
| DEC | | | | | | | | | | | | | |

SOLAR RADIATION DATA for: GREAT FALLS,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (3.02) | 90 | 67 | 58 | 53 | 49 | 44 | 36 | 27 | 15 | 3 | 0 | 0 |
| FEB | (3.75) | 93 | 83 | 72 | 63 | 54 | 48 | 41 | 34 | 27 | 13 | 3 | 1 |
| MAR | 4.23 | 92 | 77 | 67 | 59 | 54 | 47 | 41 | 34 | 24 | 12 | 1 | 0 |
| APR | 4.19 | 94 | 77 | 65 | 55 | 48 | 42 | 35 | 28 | 20 | 8 | 3 | 0 |
| MAY | 4.08 | 89 | 76 | 63 | 55 | 49 | 43 | 36 | 26 | 13 | 3 | 0 | 0 |
| JUN | 5.01 | 93 | 87 | 80 | 73 | 66 | 57 | 46 | 29 | 6 | 1 | 0 | 0 |
| JUL | 4.83 | 91 | 81 | 74 | 68 | 62 | 55 | 44 | 30 | 5 | 0 | 0 | 0 |
| AUG | (5.20) | 92 | 86 | 80 | 73 | 67 | 58 | 48 | 34 | 14 | 1 | 0 | 0 |
| SEP | 4.54 | 89 | 79 | 72 | 67 | 59 | 51 | 42 | 33 | 20 | 3 | 0 | 0 |
| OCT | 4.40 | 90 | 84 | 75 | 67 | 61 | 55 | 46 | 36 | 23 | 2 | 0 | 0 |
| NOV | (3.01) | 82 | 66 | 57 | 50 | 44 | 40 | 34 | 25 | 12 | 0 | 0 | 0 |
| DEC | (2.78) | 87 | 72 | 63 | 58 | 49 | 43 | 35 | 25 | 10 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HAMILTON,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (1.50) | 68 | 32 | 23 | 18 | 14 | 12 | 10 | 7 | 3 | 1 | 0 | 0 |
| FEB | (3.04) | 89 | 68 | 59 | 52 | 46 | 39 | 32 | 26 | 15 | 5 | 2 | 0 |
| MAR | (4.41) | 96 | 86 | 76 | 68 | 57 | 48 | 38 | 30 | 15 | 3 | 0 | 0 |
| APR | (4.16) | 93 | 85 | 75 | 60 | 50 | 41 | 30 | 19 | 10 | 2 | 0 | 0 |
| MAY | (3.10) | 88 | 65 | 49 | 40 | 30 | 24 | 15 | 7 | 3 | 1 | 0 | 0 |
| JUN | | | | | | | | | | | | | |
| JUL | | | | | | | | | | | | | |
| AUG | (4.33) | 85 | 77 | 69 | 64 | 51 | 43 | 32 | 18 | 3 | 0 | 0 | 0 |
| SEP | (3.55) | 87 | 69 | 60 | 52 | 48 | 39 | 29 | 16 | 6 | 0 | 0 | 0 |
| OCT | (5.14) | 94 | 89 | 83 | 78 | 71 | 65 | 55 | 44 | 21 | 4 | 0 | 0 |
| NOV | 2.18 | 70 | 48 | 44 | 36 | 32 | 26 | 17 | 12 | 3 | 0 | 0 | 0 |
| DEC | (2.37) | 80 | 60 | 51 | 42 | 37 | 31 | 25 | 17 | 4 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HARLOWTON,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (3.17) | 90 | 69 | 57 | 53 | 47 | 40 | 33 | 24 | 15 | 2 | 0 | 0 |
| FEB | 3.64 | 95 | 79 | 65 | 54 | 48 | 39 | 31 | 23 | 15 | 6 | 0 | 0 |
| MAR | 5.01 | 93 | 84 | 78 | 70 | 63 | 57 | 47 | 37 | 26 | 9 | 0 | 0 |
| APR | 3.98 | 88 | 74 | 63 | 52 | 45 | 38 | 33 | 22 | 15 | 6 | 1 | 0 |
| MAY | (3.77) | 88 | 71 | 58 | 49 | 40 | 32 | 25 | 18 | 9 | 1 | 0 | 0 |
| JUN | (4.44) | 88 | 81 | 74 | 68 | 60 | 51 | 40 | 21 | 1 | 0 | 0 | 0 |
| JUL | 4.50 | 89 | 80 | 72 | 64 | 56 | 47 | 38 | 21 | 1 | 0 | 0 | 0 |
| AUG | (5.14) | 96 | 90 | 82 | 75 | 67 | 58 | 47 | 31 | 10 | 1 | 0 | 0 |
| SEP | (4.62) | 87 | 77 | 73 | 65 | 59 | 52 | 45 | 36 | 23 | 4 | 0 | 0 |
| OCT | | | | | | | | | | | | | |
| NOV | | | | | | | | | | | | | |
| DEC | | | | | | | | | | | | | |

SOLAR RADIATION DATA for: HAVRE,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (2.75) | 91 | 67 | 54 | 44 | 37 | 31 | 24 | 18 | 11 | 2 | 0 | 0 |
| FEB | 3.73 | 95 | 81 | 68 | 60 | 50 | 41 | 35 | 25 | 15 | 3 | 0 | 0 |
| MAR | 4.33 | 95 | 86 | 76 | 65 | 55 | 45 | 32 | 22 | 14 | 3 | 0 | 0 |
| APR | 3.40 | 80 | 61 | 51 | 45 | 40 | 33 | 27 | 18 | 9 | 2 | 0 | 0 |
| MAY | (3.84) | 84 | 74 | 64 | 55 | 48 | 39 | 31 | 20 | 8 | 1 | 0 | 0 |
| JUN | 4.73 | 92 | 86 | 81 | 73 | 65 | 53 | 40 | 20 | 1 | 0 | 0 | 0 |
| JUL | (4.42) | 89 | 83 | 75 | 69 | 59 | 50 | 37 | 23 | 3 | 0 | 0 | 0 |
| AUG | (3.41) | 90 | 77 | 70 | 70 | 70 | 62 | 53 | 53 | 28 | 0 | 0 | 0 |
| SEP | 4.58 | 87 | 80 | 73 | 66 | 59 | 51 | 41 | 33 | 22 | 5 | 0 | 0 |
| OCT | 4.53 | 89 | 80 | 75 | 70 | 63 | 55 | 48 | 38 | 22 | 3 | 1 | 0 |
| NOV | 2.82 | 86 | 64 | 57 | 49 | 42 | 35 | 26 | 18 | 10 | 1 | 0 | 0 |
| DEC | 2.11 | 78 | 58 | 50 | 43 | 35 | 27 | 19 | 10 | 1 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: HELENA,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (2.64) | 87 | 63 | 47 | 40 | 36 | 31 | 25 | 18 | 11 | 5 | 1 | 0 |
| FEB | (3.53) | 94 | 82 | 66 | 56 | 46 | 37 | 30 | 24 | 14 | 8 | 1 | 0 |
| MAR | (4.85) | 96 | 88 | 77 | 69 | 59 | 51 | 43 | 33 | 18 | 9 | 0 | 0 |
| APR | 4.60 | 92 | 85 | 74 | 64 | 56 | 45 | 37 | 26 | 19 | 7 | 0 | 0 |
| MAY | (3.56) | 85 | 68 | 54 | 43 | 35 | 28 | 19 | 12 | 4 | 0 | 0 | 0 |
| JUN | 4.86 | 93 | 86 | 77 | 69 | 60 | 51 | 40 | 21 | 1 | 0 | 0 | 0 |
| JUL | 4.82 | 93 | 86 | 78 | 71 | 63 | 53 | 42 | 27 | 2 | 0 | 0 | 0 |
| AUG | 5.08 | 95 | 88 | 79 | 73 | 64 | 55 | 45 | 32 | 11 | 1 | 0 | 0 |
| SEP | 4.57 | 86 | 76 | 70 | 64 | 57 | 51 | 43 | 34 | 23 | 10 | 1 | 0 |
| OCT | 5.10 | 96 | 91 | 84 | 77 | 68 | 61 | 50 | 38 | 23 | 5 | 0 | 0 |
| NOV | 2.76 | 82 | 64 | 54 | 46 | 40 | 33 | 27 | 18 | 12 | 3 | 0 | 0 |
| DEC | 2.60 | 82 | 66 | 54 | 47 | 40 | 34 | 29 | 22 | 8 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: JORDAN,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | | | | | | | | | | | | | |
| MAR | | | | | | | | | | | | | |
| APR | | | | | | | | | | | | | |
| MAY | (4.12) | 85 | 71 | 63 | 56 | 50 | 43 | 30 | 20 | 5 | 1 | 0 | 0 |
| JUN | 4.98 | 94 | 89 | 84 | 74 | 65 | 53 | 41 | 22 | 3 | 0 | 0 | 0 |
| JUL | 5.14 | 91 | 86 | 79 | 72 | 63 | 52 | 39 | 24 | 1 | 0 | 0 | 0 |
| AUG | 5.55 | 95 | 90 | 83 | 78 | 71 | 61 | 52 | 37 | 13 | 0 | 0 | 0 |
| SEP | (4.91) | 85 | 79 | 76 | 71 | 65 | 58 | 48 | 37 | 18 | 1 | 0 | 0 |
| OCT | 4.31 | 91 | 82 | 75 | 68 | 59 | 51 | 39 | 27 | 10 | 0 | 0 | 0 |
| NOV | (2.38) | 71 | 53 | 47 | 40 | 34 | 28 | 22 | 11 | 1 | 0 | 0 | 0 |
| DEC | (2.09) | 85 | 63 | 53 | 43 | 37 | 26 | 10 | 2 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: KALISPELL,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 1.55 | 77 | 30 | 25 | 21 | 15 | 12 | 9 | 7 | 6 | 3 | 0 | 0 |
| FEB | 2.78 | 89 | 65 | 52 | 43 | 37 | 32 | 26 | 20 | 14 | 4 | 1 | 0 |
| MAR | 4.34 | 94 | 77 | 66 | 58 | 50 | 44 | 38 | 33 | 24 | 13 | 6 | 0 |
| APR | 3.77 | 93 | 74 | 58 | 47 | 39 | 32 | 25 | 18 | 11 | 4 | 1 | 0 |
| MAY | (3.69) | 90 | 74 | 58 | 48 | 41 | 31 | 24 | 19 | 11 | 3 | 0 | 0 |
| JUN | 4.86 | 93 | 84 | 76 | 66 | 59 | 49 | 38 | 27 | 5 | 0 | 0 | 0 |
| JUL | (4.73) | 94 | 84 | 77 | 69 | 62 | 51 | 39 | 18 | 1 | 0 | 0 | 0 |
| AUG | 4.24 | 91 | 80 | 70 | 62 | 51 | 44 | 31 | 16 | 1 | 0 | 0 | 0 |
| SEP | 3.59 | 88 | 74 | 64 | 56 | 48 | 38 | 32 | 25 | 14 | 2 | 0 | 0 |
| OCT | (4.69) | 96 | 89 | 83 | 76 | 68 | 59 | 48 | 35 | 17 | 2 | 0 | 0 |
| NOV | 2.33 | 75 | 51 | 46 | 41 | 34 | 29 | 25 | 20 | 10 | 2 | 0 | 0 |
| DEC | (1.99) | 74 | 46 | 41 | 36 | 29 | 24 | 20 | 15 | 11 | 2 | 0 | 0 |

SOLAR RADIATION DATA for: LEWISTOWN, MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (2.71) | 88 | 60 | 53 | 49 | 42 | 39 | 31 | 22 | 13 | 1 | 0 | 0 |
| FEB | (3.66) | 94 | 75 | 61 | 53 | 47 | 43 | 37 | 30 | 18 | 11 | 1 | 0 |
| MAR | 5.12 | 96 | 89 | 80 | 70 | 62 | 55 | 48 | 38 | 26 | 11 | 0 | 0 |
| APR | (3.95) | 89 | 76 | 64 | 54 | 45 | 36 | 29 | 24 | 15 | 6 | 0 | 0 |
| MAY | (4.00) | 87 | 76 | 64 | 56 | 45 | 36 | 26 | 19 | 6 | 1 | 0 | 0 |
| JUN | 4.89 | 91 | 85 | 78 | 71 | 63 | 53 | 42 | 24 | 4 | 1 | 0 | 0 |
| JUL | (4.41) | 93 | 80 | 72 | 63 | 52 | 44 | 35 | 19 | 2 | 0 | 0 | 0 |
| AUG | | | | | | | | | | | | | |
| SEP | (4.49) | 88 | 77 | 69 | 63 | 57 | 51 | 44 | 35 | 21 | 1 | 0 | 0 |
| OCT | (4.91) | 94 | 87 | 80 | 71 | 64 | 56 | 48 | 37 | 22 | 4 | 0 | 0 |
| NOV | (2.89) | 88 | 63 | 54 | 43 | 34 | 26 | 19 | 13 | 9 | 0 | 0 | 0 |
| DEC | (2.99) | 90 | 73 | 64 | 55 | 47 | 39 | 32 | 25 | 10 | 1 | 0 | 0 |

SOLAR RADIATION DATA for: LIBBY,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (2.72) | 92 | 70 | 55 | 46 | 37 | 32 | 28 | 21 | 9 | 3 | 1 | 0 |
| MAR | 3.76 | 92 | 76 | 64 | 55 | 49 | 43 | 36 | 28 | 16 | 7 | 1 | 0 |
| APR | (3.41) | 90 | 74 | 60 | 46 | 36 | 28 | 20 | 13 | 8 | 1 | 0 | 0 |
| MAY | 3.60 | 90 | 72 | 56 | 44 | 33 | 27 | 20 | 15 | 7 | 2 | 0 | 0 |
| JUN | 4.74 | 94 | 86 | 76 | 68 | 57 | 46 | 34 | 21 | 1 | 0 | 0 | 0 |
| JUL | (4.50) | 93 | 82 | 73 | 66 | 55 | 43 | 35 | 25 | 1 | 0 | 0 | 0 |
| AUG | (3.75) | 89 | 71 | 63 | 53 | 44 | 37 | 29 | 20 | 6 | 0 | 0 | 0 |
| SEP | (3.21) | 90 | 74 | 62 | 53 | 46 | 36 | 29 | 21 | 12 | 3 | 1 | 0 |
| OCT | (4.13) | 96 | 89 | 83 | 76 | 70 | 60 | 50 | 37 | 20 | 0 | 0 | 0 |
| NOV | 2.03 | 67 | 55 | 48 | 43 | 37 | 32 | 25 | 17 | 7 | 0 | 0 | 0 |
| DEC | (1.61) | 66 | 51 | 45 | 35 | 28 | 25 | 19 | 12 | 4 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: LIVINGSTON,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (3.97) | 95 | 76 | 66 | 62 | 54 | 49 | 39 | 30 | 22 | 16 | 6 | 0 |
| MAR | 4.64 | 93 | 83 | 75 | 68 | 59 | 54 | 46 | 38 | 30 | 20 | 4 | 2 |
| APR | (4.22) | 94 | 84 | 69 | 58 | 50 | 42 | 31 | 26 | 18 | 10 | 3 | 0 |
| MAY | (3.60) | 85 | 68 | 56 | 49 | 39 | 32 | 26 | 17 | 8 | 3 | 0 | 0 |
| JUN | (5.23) | 95 | 90 | 83 | 75 | 68 | 60 | 48 | 36 | 2 | 0 | 0 | 0 |
| JUL | 4.74 | 94 | 82 | 76 | 70 | 64 | 53 | 42 | 28 | 3 | 0 | 0 | 0 |
| AUG | (5.11) | 95 | 88 | 81 | 75 | 69 | 59 | 47 | 33 | 8 | 0 | 0 | 0 |
| SEP | (5.11) | 95 | 89 | 85 | 79 | 73 | 64 | 50 | 41 | 14 | 3 | 0 | 0 |
| OCT | (4.71) | 93 | 88 | 82 | 75 | 68 | 58 | 47 | 38 | 28 | 10 | 0 | 0 |
| NOV | (4.00) | 94 | 80 | 74 | 65 | 61 | 51 | 40 | 33 | 23 | 6 | 2 | 1 |
| DEC | (2.21) | 89 | 71 | 59 | 45 | 37 | 25 | 22 | 20 | 11 | 2 | 0 | 0 |

SOLAR RADIATION DATA for: MILES CITY,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 3.11 | 93 | 73 | 59 | 50 | 41 | 36 | 29 | 22 | 16 | 3 | 0 | 0 |
| FEB | (3.87) | 94 | 81 | 69 | 59 | 52 | 44 | 35 | 27 | 20 | 11 | 0 | 0 |
| MAR | 4.70 | 95 | 86 | 75 | 66 | 56 | 51 | 43 | 35 | 25 | 11 | 1 | 0 |
| APR | 4.05 | 83 | 73 | 61 | 53 | 47 | 41 | 35 | 27 | 19 | 3 | 0 | 0 |
| MAY | 3.71 | 82 | 66 | 56 | 46 | 41 | 35 | 27 | 17 | 2 | 0 | 0 | 0 |
| JUN | 4.64 | 94 | 86 | 76 | 66 | 56 | 45 | 33 | 11 | 0 | 0 | 0 | 0 |
| JUL | (4.75) | 93 | 87 | 78 | 68 | 58 | 50 | 37 | 17 | 1 | 0 | 0 | 0 |
| AUG | | | | | | | | | | | | | |
| SEP | (4.80) | 80 | 73 | 71 | 66 | 61 | 56 | 50 | 43 | 32 | 11 | 0 | 0 |
| OCT | 4.62 | 95 | 86 | 80 | 70 | 61 | 53 | 44 | 35 | 20 | 2 | 0 | 0 |
| NOV | 3.13 | 83 | 61 | 54 | 50 | 45 | 39 | 33 | 27 | 15 | 4 | 0 | 0 |
| DEC | 2.96 | 85 | 72 | 63 | 59 | 50 | 42 | 35 | 27 | 16 | 6 | 0 | 0 |

SOLAR RADIATION DATA for: MISSOULA,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (1.46) | 63 | 36 | 27 | 22 | 20 | 15 | 10 | 7 | 3 | 1 | 1 | 0 |
| FEB | (2.39) | 85 | 62 | 46 | 38 | 31 | 26 | 18 | 14 | 9 | 3 | 0 | 0 |
| MAR | 4.36 | 94 | 85 | 76 | 68 | 58 | 46 | 37 | 29 | 21 | 9 | 1 | 0 |
| APR | 4.03 | 95 | 83 | 71 | 59 | 48 | 39 | 27 | 20 | 12 | 4 | 0 | 0 |
| MAY | (3.04) | 87 | 64 | 49 | 36 | 29 | 21 | 14 | 10 | 5 | 1 | 0 | 0 |
| JUN | 4.50 | 91 | 83 | 75 | 67 | 58 | 49 | 33 | 14 | 2 | 0 | 0 | 0 |
| JUL | 4.70 | 93 | 84 | 76 | 68 | 58 | 50 | 39 | 25 | 4 | 0 | 0 | 0 |
| AUG | 4.59 | 92 | 83 | 74 | 66 | 58 | 46 | 35 | 23 | 4 | 0 | 0 | 0 |
| SEP | (3.79) | 81 | 70 | 63 | 56 | 48 | 41 | 29 | 23 | 15 | 3 | 1 | 0 |
| OCT | (4.92) | 97 | 91 | 85 | 76 | 69 | 62 | 50 | 39 | 23 | 9 | 1 | 0 |
| NOV | (2.67) | 76 | 64 | 56 | 51 | 45 | 39 | 30 | 19 | 10 | 1 | 1 | 0 |
| DEC | 1.93 | 74 | 55 | 47 | 40 | 33 | 27 | 19 | 9 | 2 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: PLENTYWOOD,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (4.52) | 97 | 90 | 81 | 72 | 64 | 57 | 48 | 40 | 32 | 17 | 2 | 0 |
| MAR | (4.86) | 92 | 86 | 77 | 69 | 61 | 52 | 46 | 36 | 27 | 18 | 6 | 0 |
| APR | (3.62) | 79 | 65 | 55 | 49 | 44 | 38 | 33 | 24 | 13 | 4 | 0 | 0 |
| MAY | (3.90) | 85 | 74 | 64 | 55 | 44 | 34 | 25 | 14 | 4 | 1 | 0 | 0 |
| JUN | (4.83) | 92 | 82 | 75 | 68 | 58 | 50 | 40 | 24 | 5 | 0 | 0 | 0 |
| JUL | (4.71) | 93 | 85 | 77 | 71 | 61 | 50 | 38 | 19 | 3 | 0 | 0 | 0 |
| AUG | (5.02) | 95 | 89 | 82 | 77 | 69 | 60 | 47 | 32 | 14 | 1 | 0 | 0 |
| SEP | (4.53) | 90 | 83 | 79 | 73 | 66 | 58 | 48 | 36 | 18 | 1 | 0 | 0 |
| OCT | (4.31) | 95 | 86 | 81 | 74 | 65 | 57 | 47 | 34 | 22 | 9 | 0 | 0 |
| NOV | (2.57) | 79 | 61 | 51 | 46 | 40 | 33 | 26 | 18 | 3 | 0 | 0 | 0 |
| DEC | 2.45 | 87 | 69 | 55 | 46 | 41 | 32 | 25 | 13 | 2 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: POLSON,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 1.33 | 80 | 34 | 22 | 14 | 10 | 7 | 6 | 5 | 3 | 2 | 0 | 0 |
| FEB | 2.77 | 90 | 72 | 54 | 44 | 34 | 27 | 20 | 14 | 11 | 5 | 0 | 0 |
| MAR | 4.65 | 93 | 83 | 72 | 65 | 59 | 52 | 45 | 37 | 27 | 15 | 6 | 1 |
| APR | 4.16 | 93 | 80 | 67 | 59 | 49 | 39 | 31 | 20 | 10 | 1 | 0 | 0 |
| MAY | 3.51 | 87 | 72 | 57 | 48 | 36 | 27 | 21 | 14 | 4 | 1 | 0 | 0 |
| JUN | 4.81 | 91 | 85 | 78 | 71 | 64 | 54 | 42 | 25 | 3 | 1 | 0 | 0 |
| JUL | (4.98) | 94 | 89 | 82 | 74 | 65 | 56 | 45 | 28 | 1 | 0 | 0 | 0 |
| AUG | 4.65 | 92 | 84 | 75 | 66 | 58 | 50 | 42 | 28 | 8 | 1 | 0 | 0 |
| SEP | (3.75) | 87 | 70 | 59 | 52 | 46 | 40 | 32 | 27 | 16 | 3 | 0 | 0 |
| OCT | 4.74 | 94 | 88 | 82 | 75 | 68 | 57 | 52 | 40 | 23 | 4 | 0 | 0 |
| NOV | 2.22 | 69 | 52 | 43 | 39 | 34 | 28 | 23 | 16 | 9 | 1 | 1 | 0 |
| DEC | 1.79 | 70 | 48 | 38 | 34 | 30 | 26 | 19 | 10 | 6 | 1 | 0 | 0 |

SOLAR RADIATION DATA for: REDLODGE,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (3.60) | 88 | 69 | 62 | 51 | 47 | 42 | 38 | 29 | 23 | 18 | 4 | 0 |
| MAR | 4.76 | 89 | 81 | 74 | 65 | 59 | 52 | 44 | 34 | 27 | 14 | 3 | 0 |
| APR | (3.37) | 83 | 71 | 61 | 49 | 39 | 34 | 27 | 20 | 12 | 3 | 0 | 0 |
| MAY | 3.59 | 85 | 67 | 57 | 48 | 41 | 35 | 24 | 15 | 7 | 1 | 0 | 0 |
| JUN | (3.92) | 91 | 79 | 64 | 51 | 43 | 35 | 28 | 17 | 2 | 0 | 0 | 0 |
| JUL | 4.29 | 88 | 78 | 70 | 61 | 54 | 45 | 35 | 23 | 6 | 0 | 0 | 0 |
| AUG | (4.69) | 92 | 81 | 73 | 66 | 61 | 53 | 44 | 31 | 11 | 0 | 0 | 0 |
| SEP | (4.70) | 91 | 82 | 75 | 67 | 56 | 48 | 39 | 31 | 21 | 6 | 2 | 0 |
| OCT | (5.22) | 97 | 93 | 89 | 83 | 75 | 66 | 57 | 44 | 25 | 3 | 0 | 0 |
| NOV | 3.42 | 90 | 72 | 64 | 57 | 50 | 42 | 33 | 24 | 16 | 3 | 0 | 0 |
| DEC | 3.18 | 93 | 82 | 75 | 65 | 58 | 50 | 40 | 29 | 11 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: SIDNEY,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (4.56) | 97 | 92 | 81 | 71 | 62 | 50 | 44 | 37 | 30 | 21 | 2 | 0 |
| MAR | (4.74) | 97 | 89 | 79 | 67 | 58 | 50 | 43 | 36 | 27 | 14 | 4 | 1 |
| APR | (3.44) | 82 | 61 | 53 | 46 | 41 | 36 | 32 | 25 | 16 | 5 | 1 | 0 |
| MAY | (3.66) | 86 | 71 | 62 | 55 | 49 | 43 | 36 | 24 | 3 | 0 | 0 | 0 |
| JUN | (4.04) | 91 | 76 | 67 | 59 | 54 | 48 | 39 | 23 | 6 | 1 | 0 | 0 |
| JUL | | | | | | | | | | | | | |
| AUG | | | | | | | | | | | | | |
| SEP | | | | | | | | | | | | | |
| OCT | | | | | | | | | | | | | |
| NOV | (2.84) | 79 | 57 | 49 | 47 | 43 | 40 | 32 | 23 | 14 | 0 | 0 | 0 |
| DEC | (2.09) | 78 | 60 | 48 | 40 | 33 | 24 | 15 | 6 | 0 | 0 | 0 | 0 |

SOLAR RADIATION DATA for: THOMPSON FALLS,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | | | | | | | | | | | | | |
| FEB | (2.21) | 74 | 53 | 41 | 34 | 29 | 23 | 18 | 16 | 10 | 2 | 0 | 0 |
| MAR | (3.41) | 88 | 69 | 57 | 48 | 43 | 37 | 32 | 27 | 20 | 10 | 3 | 0 |
| APR | (3.56) | 92 | 77 | 63 | 52 | 44 | 35 | 27 | 17 | 8 | 1 | 0 | 0 |
| MAY | 3.22 | 90 | 66 | 50 | 41 | 35 | 30 | 24 | 16 | 9 | 4 | 0 | 1 |
| JUN | (4.62) | 91 | 82 | 74 | 66 | 56 | 47 | 37 | 26 | 4 | 0 | 0 | 0 |
| JUL | (4.42) | 91 | 81 | 73 | 63 | 54 | 45 | 36 | 20 | 2 | 0 | 0 | 0 |
| AUG | (3.42) | 75 | 64 | 56 | 48 | 40 | 34 | 27 | 21 | 12 | 2 | 0 | 0 |
| SEP | | | | | | | | | | | | | |
| OCT | (4.47) | 94 | 86 | 81 | 76 | 68 | 57 | 47 | 32 | 14 | 1 | 0 | 0 |
| NOV | 2.02 | 65 | 49 | 39 | 35 | 31 | 25 | 18 | 11 | 4 | 0 | 0 | 0 |
| DEC | (1.39) | 53 | 35 | 29 | 25 | 19 | 15 | 13 | 7 | 3 | 1 | 0 | 0 |

SOLAR RADIATION DATA for: WEST YELLOWSTONE,MONTANA 1978

Montana Department of Natural Resources and Conservation
compiled by: Fowlkes Engineering, Bozeman, Mt.

| MONTH | DAILY AVERAGE KWH/SM/DAY | PER CENT TOTAL ENERGY ABOVE THRESHOLD (KW/SM) >.1 | >.2 | >.3 | >.4 | >.5 | >.6 | >.7 | >.8 | >.9 | >1.0 | >1.1 | >1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | (1.37) | 76 | 39 | 22 | 17 | 14 | 13 | 11 | 8 | 6 | 1 | 1 | 0 |
| FEB | (3.30) | 91 | 73 | 62 | 50 | 44 | 38 | 32 | 25 | 19 | 13 | 5 | 0 |
| MAR | 4.81 | 95 | 85 | 75 | 69 | 63 | 55 | 46 | 38 | 26 | 13 | 3 | 0 |
| APR | 4.20 | 95 | 86 | 73 | 60 | 47 | 38 | 29 | 22 | 15 | 4 | 1 | 0 |
| MAY | 3.76 | 91 | 79 | 64 | 52 | 41 | 33 | 21 | 13 | 3 | 1 | 0 | 0 |
| JUN | 4.64 | 93 | 86 | 77 | 68 | 59 | 49 | 35 | 12 | 2 | 0 | 0 | 0 |
| JUL | (4.60) | 94 | 86 | 78 | 67 | 57 | 48 | 35 | 17 | 1 | 0 | 0 | 0 |
| AUG | | | | | | | | | | | | | |
| SEP | (5.78) | 96 | 88 | 83 | 78 | 73 | 67 | 59 | 48 | 36 | 11 | 1 | 0 |
| OCT | 5.78 | 97 | 94 | 90 | 85 | 78 | 71 | 61 | 51 | 36 | 12 | 0 | 0 |
| NOV | 2.70 | 80 | 61 | 51 | 45 | 38 | 33 | 28 | 23 | 16 | 4 | 0 | 0 |
| DEC | 2.88 | 77 | 64 | 55 | 50 | 43 | 38 | 32 | 23 | 12 | 3 | 0 | 0 |

MANUAL SOLAR MEASUREMENT STATION

1977-78 Average Radiation, kWh/$m^2$-day

| STATION | SEPT | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SEPT | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Baker | | | | | | | | | | | | | 2.70 |
| Big Timber | | | 2.08 | .63 | .82 | 1.44 | 1.99 | 1.74 | 2.74 | | | | |
| Billings | | | | | | | | | | | | | 3.04 |
| Boulder | | | | | | | | | | | | | 2.82 |
| Broadus | 5.31 | 5.10 | 2.82 | 3.94 | 3.13 | 4.81 | 5.04 | | | 2.73 | 5.03 | 3.01 | 2.62 |
| Chester | | 3.89 | 3.39 | 1.95 | 2.47 | 3.38 | 3.86 | 3.28 | | 5.19 | 5.06 | 3.15 | 2.29 |
| Chinook | 4.24 | 5.83 | 4.65 | 2.95 | 2.28 | 4.01 | 5.16 | 4.09 | 4.87 | | | | |
| Circle | 3.87 | 5.17 | 3.30 | 2.17 | 2.66 | 3.77 | 3.28 | 5.18 | 2.90 | | | | |
| Columbus | | 4.82 | 3.20 | 2.33 | 2.61 | 2.95 | 4.76 | | | | | | |
| Conrad | | | | | | | | | | | | | 3.14 |
| Culbertson | | | | | | | | | | | | | 2.00 |
| Deer Lodge | 4.10 | 5.15 | 2.37 | 1.27 | | 3.08 | 4.93 | 4.04 | 3.35 | 4.46 | 4.19 | 3.43 | |
| Ekalaka | 5.05 | 6.15 | 3.47 | 2.93 | 3.29 | 4.75 | 4.65 | 5.08 | 4.53 | 5.67 | 4.60 | 3.38 | 2.07 |
| Forsyth | | | | | | | | | | | | | 2.62 |
| Hardin | | | 3.92 | 2.49 | 2.93 | 4.36 | 6.13 | 4.49 | 3.52 | 6.64 | 4.75 | 4.15 | |
| Harlem | | | | | | | | | | | | | 2.35 |
| Hobson | 4.96 | 4.38 | 2.68 | 1.45 | 2.59 | 3.59 | | 5.24 | 3.78 | 4.42 | 4.23 | 3.60 | 2.11 |
| Malta | | 5.61 | 3.55 | 2.46 | 1.74 | 3.49 | 3.60 | 4.28 | 4.11 | | 3.98 | 2.44 | 2.22 |
| Missoula | | | | | | | | | | | | | 1.82 |
| Roundup | 4.11 | 5.39 | 3.33 | 1.53 | 1.94 | 2.87 | 4.86 | 5.20 | 4.55 | 5.18 | 4.77 | 3.17 | 2.26 |
| Superior | 3.04 | 4.13 | | | | | | 3.19 | | | 4.24 | 1.77 | |
| Townsend | 6.67 | 5.44 | 2.93 | 1.45 | 2.54 | 4.58 | 5.26 | 4.76 | 4.71 | 4.48 | 4.78 | 3.62 | 1.97 |
| Wh.Sulphur Spgs. | | 4.02 | 2.71 | 1.20 | 2.25 | 4.23 | 4.34 | 4.85 | | | 5.25 | 3.13 | 2.12 |
| Winnett | 5.87 | 5.64 | 4.00 | 2.44 | 2.24 | 3.22 | 4.82 | 5.90 | 5.01 | | | | |
| Wolf Point | 5.05 | 5.79 | 4.02 | 2.89 | 3.63 | 4.36 | 5.43 | 5.54 | 4.42 | 4.87 | 2.83 | 1.78 | |

## 48 Degrees North Latitude

| DATE | SOLAR TIME AM | SOLAR TIME PM | SOLAR POSITION ALT | SOLAR POSITION AZM | BTUH/SQ. FT. TOTAL INSOLATION ON SURFACES NORMAL | HORIZ. | SOUTH FACING SURFACE ANGLE WITH HORIZ 38 | 48 | 58 | 68 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN 21 | 8 | 4 | 3.5 | 54.6 | 37 | 4 | 17 | 19 | 21 | 22 | 22 |
| | 9 | 3 | 11.0 | 42.6 | 185 | 46 | 120 | 132 | 140 | 145 | 139 |
| | 10 | 2 | 16.9 | 29.4 | 239 | 83 | 190 | 206 | 216 | 220 | 206 |
| | 11 | 1 | 20.7 | 15.1 | 261 | 107 | 231 | 249 | 260 | 263 | 243 |
| | 12 | | 22.0 | 0.0 | 267 | 115 | 245 | 264 | 275 | 278 | 255 |
| | SURFACE DAILY TOTALS | | | | 1710 | 596 | 1360 | 1478 | 1550 | 1578 | 1478 |
| FEB 21 | 7 | 5 | 2.4 | 72.2 | 12 | 1 | 3 | 4 | 4 | 4 | 4 |
| | 8 | 4 | 11.6 | 60.5 | 188 | 49 | 95 | 102 | 105 | 106 | 96 |
| | 9 | 3 | 19.7 | 47.7 | 251 | 100 | 178 | 187 | 191 | 190 | 167 |
| | 10 | 2 | 26.2 | 33.3 | 278 | 139 | 240 | 251 | 255 | 251 | 217 |
| | 11 | 1 | 30.5 | 17.2 | 290 | 165 | 278 | 290 | 294 | 288 | 247 |
| | 12 | | 32.0 | 0.0 | 293 | 173 | 291 | 304 | 307 | 301 | 258 |
| | SURFACE DAILY TOTALS | | | | 2330 | 1080 | 1890 | 1972 | 2024 | 1978 | 1720 |
| MAR 21 | 7 | 5 | 10.0 | 78.7 | 153 | 37 | 49 | 49 | 47 | 45 | 35 |
| | 8 | 4 | 19.5 | 66.8 | 236 | 96 | 131 | 132 | 129 | 122 | 96 |
| | 9 | 3 | 28.2 | 53.4 | 270 | 147 | 205 | 207 | 203 | 193 | 152 |
| | 10 | 2 | 35.4 | 37.8 | 287 | 187 | 263 | 265 | 261 | 248 | 195 |
| | 11 | 1 | 40.3 | 19.8 | 295 | 212 | 300 | 303 | 297 | 283 | 223 |
| | 12 | | 42.0 | 0.0 | 298 | 220 | 312 | 315 | 309 | 294 | 232 |
| | SURFACE DAILY TOTALS | | | | 2780 | 1578 | 2208 | 2228 | 2182 | 2074 | 1632 |
| APR 21 | 6 | 6 | 8.6 | 97.8 | 108 | 27 | 13 | 9 | 8 | 7 | 5 |
| | 7 | 5 | 18.6 | 86.7 | 205 | 85 | 76 | 69 | 59 | 48 | 21 |
| | 8 | 4 | 28.5 | 74.9 | 247 | 142 | 149 | 141 | 129 | 113 | 69 |
| | 9 | 3 | 37.8 | 61.2 | 268 | 191 | 216 | 208 | 194 | 174 | 115 |
| | 10 | 2 | 45.8 | 44.6 | 280 | 228 | 268 | 260 | 245 | 223 | 152 |
| | 11 | 1 | 51.5 | 24.0 | 286 | 252 | 301 | 294 | 278 | 254 | 177 |
| | 12 | | 53.6 | 0.0 | 288 | 260 | 313 | 305 | 289 | 264 | 185 |
| | SURFACE DAILY TOTALS | | | | 3076 | 2106 | 2358 | 2266 | 2114 | 1902 | 1262 |
| MAY 21 | 5 | 7 | 5.2 | 114.3 | 41 | 9 | 4 | 4 | 4 | 3 | 2 |
| | 6 | 6 | 14.7 | 103.7 | 162 | 61 | 27 | 16 | 15 | 13 | 10 |
| | 7 | 5 | 24.6 | 93.0 | 219 | 118 | 89 | 75 | 60 | 43 | 13 |
| | 8 | 4 | 34.7 | 81.6 | 248 | 171 | 156 | 142 | 123 | 101 | 45 |
| | 9 | 3 | 44.3 | 68.3 | 264 | 217 | 217 | 202 | 182 | 156 | 86 |
| | 10 | 2 | 53.0 | 51.3 | 274 | 252 | 265 | 251 | 229 | 200 | 120 |
| | 11 | 1 | 59.5 | 28.6 | 279 | 274 | 296 | 281 | 258 | 228 | 141 |
| | 12 | | 62.0 | 0.0 | 280 | 281 | 306 | 292 | 269 | 238 | 149 |
| | SURFACE DAILY TOTALS | | | | 3254 | 2482 | 2418 | 2234 | 2010 | 1728 | 982 |
| JUN 21 | 5 | 7 | 7.9 | 116.5 | 77 | 21 | 9 | 9 | 8 | 7 | 5 |
| | 6 | 6 | 17.2 | 106.2 | 172 | 74 | 33 | 19 | 18 | 16 | 12 |
| | 7 | 5 | 27.0 | 95.8 | 220 | 129 | 93 | 77 | 59 | 39 | 15 |
| | 8 | 4 | 37.1 | 84.6 | 246 | 181 | 157 | 140 | 119 | 95 | 35 |
| | 9 | 3 | 46.9 | 71.6 | 261 | 225 | 216 | 198 | 175 | 147 | 74 |
| | 10 | 2 | 55.8 | 54.8 | 269 | 259 | 262 | 244 | 220 | 189 | 105 |
| | 11 | 1 | 62.7 | 31.2 | 274 | 280 | 291 | 273 | 248 | 216 | 126 |
| | 12 | | 65.5 | 0.0 | 275 | 287 | 301 | 283 | 258 | 225 | 133 |
| | SURFACE DAILY TOTALS | | | | 3312 | 2626 | 2420 | 2204 | 1950 | 1644 | 874 |
| JUL 21 | 5 | 7 | 5.7 | 114.7 | 43 | 10 | 5 | 5 | 4 | 4 | 3 |
| | 6 | 6 | 15.2 | 104.1 | 156 | 62 | 28 | 18 | 16 | 15 | 11 |
| | 7 | 5 | 25.1 | 93.5 | 211 | 118 | 89 | 75 | 59 | 42 | 14 |
| | 8 | 4 | 35.1 | 82.1 | 240 | 171 | 154 | 140 | 121 | 99 | 43 |
| | 9 | 3 | 44.8 | 68.8 | 256 | 215 | 214 | 199 | 178 | 153 | 83 |
| | 10 | 2 | 53.5 | 51.9 | 266 | 250 | 261 | 246 | 224 | 195 | 116 |
| | 11 | 1 | 60.1 | 29.0 | 271 | 272 | 291 | 276 | 253 | 223 | 137 |
| | 12 | | 62.6 | 0.0 | 272 | 279 | 301 | 286 | 263 | 232 | 144 |
| | SURFACE DAILY TOTALS | | | | 3158 | 2474 | 2386 | 2200 | 1974 | 1694 | 956 |

| DATE | SOLAR TIME AM | SOLAR TIME PM | SOLAR POSITION ALT | SOLAR POSITION AZM | BTUH/SQ. FT. TOTAL INSOLATION ON SURFACES NORMAL | HORIZ. | SOUTH FACING SURFACE ANGLE WITH HORIZ. 38 | 48 | 58 | 68 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AUG 21 | 6 | 6 | 9.1 | 98.3 | 99 | 28 | 14 | 10 | 9 | 8 | 6 |
| | 7 | 5 | 19.1 | 87.2 | 190 | 85 | 75 | 67 | 58 | 47 | 20 |
| | 8 | 4 | 29.0 | 75.4 | 232 | 141 | 145 | 137 | 125 | 109 | 65 |
| | 9 | 3 | 38.4 | 61.8 | 254 | 189 | 210 | 201 | 187 | 168 | 119 |
| | 10 | 2 | 46.4 | 45.1 | 266 | 225 | 260 | 252 | 237 | 214 | 149 |
| | 11 | 1 | 52.2 | 24.3 | 272 | 248 | 293 | 285 | 268 | 244 | 169 |
| | 12 | | 54.3 | 0.0 | 274 | 256 | 304 | 295 | 279 | 255 | 177 |
| | SURFACE DAILY TOTALS | | | | 2858 | 2086 | 2300 | 2270 | 2046 | 1835 | 1268 |
| SEP 21 | 7 | 5 | 10.0 | 78.7 | 131 | 35 | 44 | 44 | 43 | 40 | 31 |
| | 8 | 4 | 19.5 | 66.8 | 215 | 92 | 124 | 124 | 121 | 115 | 90 |
| | 9 | 3 | 28.2 | 53.4 | 251 | 142 | 196 | 197 | 193 | 183 | 143 |
| | 10 | 2 | 35.4 | 37.8 | 269 | 191 | 251 | 254 | 248 | 236 | 185 |
| | 11 | 1 | 40.3 | 19.8 | 278 | 205 | 287 | 289 | 284 | 269 | 212 |
| | 12 | | 42.0 | 0.0 | 280 | 213 | 299 | 302 | 296 | 281 | 221 |
| | SURFACE DAILY TOTALS | | | | 2568 | 1522 | 2102 | 2118 | 2070 | 1966 | 1546 |
| OCT 21 | 7 | 5 | 2.0 | 71.9 | 4 | 0 | 1 | 1 | 1 | 1 | 1 |
| | 8 | 4 | 11.2 | 60.2 | 165 | 44 | 86 | 91 | 95 | 95 | 87 |
| | 9 | 3 | 19.3 | 47.4 | 233 | 94 | 157 | 176 | 180 | 178 | 157 |
| | 10 | 2 | 25.7 | 33.1 | 262 | 133 | 228 | 239 | 242 | 239 | 207 |
| | 11 | 1 | 30.0 | 17.1 | 274 | 157 | 286 | 277 | 281 | 276 | 237 |
| | 12 | | 31.5 | 0.0 | 278 | 165 | 279 | 291 | 294 | 288 | 247 |
| | SURFACE DAILY TOTALS | | | | 2154 | 1022 | 1774 | 1860 | 1890 | 1866 | 1625 |
| NOV 21 | 8 | 4 | 3.6 | 54.7 | 36 | 5 | 17 | 19 | 21 | 22 | 22 |
| | 9 | 3 | 11.2 | 42.7 | 179 | 46 | 117 | 129 | 137 | 141 | 135 |
| | 10 | 2 | 17.1 | 29.5 | 233 | 83 | 186 | 202 | 212 | 215 | 201 |
| | 11 | 1 | 20.9 | 15.1 | 255 | 107 | 227 | 245 | 255 | 258 | 238 |
| | 12 | | 22.2 | 0.0 | 261 | 115 | 241 | 259 | 270 | 272 | 250 |
| | SURFACE DAILY TOTALS | | | | 1668 | 596 | 1336 | 1448 | 1518 | 1544 | 1442 |
| DEC 21 | 9 | 3 | 8.0 | 40.9 | 140 | 27 | 87 | 98 | 105 | 110 | 103 |
| | 10 | 2 | 13.6 | 28.2 | 214 | 63 | 154 | 180 | 192 | 197 | 190 |
| | 11 | 1 | 17.3 | 14.4 | 242 | 86 | 207 | 226 | 239 | 244 | 231 |
| | 12 | | 18.6 | 0.0 | 250 | 94 | 222 | 241 | 254 | 260 | 244 |
| | SURFACE DAILY TOTALS | | | | 1444 | 446 | 1136 | 1250 | 1326 | 1364 | 1304 |

Note: To make these values correspond to the ASHRAE clear day model used in this Manual, multiply by a clearness factor of 1.05 for April through October, and 1.08 for the rest of the year (reflection from snow in winter).

317 BTUH/ft$^2$ = 1 kW/m$^2$

## CLOUDY DAY STATISTICS

1977: pages 93 - 95

1978: pages 97 - 100

BILLINGS, 1977

| YEAR ROUND(291) | | | | | | | | | HEATING SEASON(165) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 14 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |

BOZEMAN, 1977

| YEAR ROUND(331) | | | | | | | | | HEATING SEASON(208) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 23 | 11 | 1 | 1 | 0 | 0 | 0 | 0 | 19 | 10 | 1 | 1 | 0 | 0 | 0 | 0 |

BROWNING, 1977

| YEAR ROUND(227) | | | | | | | | | HEATING SEASON(131) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 9 | 7 | 2 | 2 | 0 | 0 | 0 | 0 | 7 | 5 | 1 | 2 | 0 | 0 | 0 | 0 |

BUTTE, 1977

| YEAR ROUND(240) | | | | | | | | | HEATING SEASON(186) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 16 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 11 | 3 | 4 | 0 | 0 | 0 | 0 | 0 |

COLSTRIP, 1977

| YEAR ROUND(107) | | | | | | | | | HEATING SEASON( 89) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

DILLON, 1977

| YEAR ROUND(307) | | | | | | | | | HEATING SEASON(189) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 21 | 4 | 1 | 0 | 1 | 0 | 0 | 0 | 15 | 4 | 1 | 0 | 0 | 0 | 0 | 0 |

GLASGOW, 1977

| YEAR ROUND(328) | | | | | | | | | HEATING SEASON(206) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 12 | 7 | 4 | 1 | 1 | 0 | 0 | 0 | 8 | 7 | 3 | 1 | 1 | 0 | 0 | 0 |

GLENDIVE, 1977

| YEAR ROUND(304) | | | | | | | | | HEATING SEASON(202) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 19 | 8 | 2 | 0 | 1 | 0 | 0 | 0 | | 14 | 7 | 2 | 0 | 1 | 0 | 0 | 0 |

GREAT FALLS, 1977

| YEAR ROUND(328) | | | | | | | | | HEATING SEASON(194) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 21 | 2 | 1 | 2 | 1 | 0 | 0 | 0 | | 17 | 1 | 0 | 2 | 1 | 0 | 0 | 0 |

HAMILTON, 1977

| YEAR ROUND(224) | | | | | | | | | HEATING SEASON(146) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 10 | 4 | 2 | 0 | 1 | 0 | 0 | 1 | | 8 | 3 | 2 | 0 | 1 | 0 | 0 | 1 |

HARLOWTON, 1977

| YEAR ROUND(286) | | | | | | | | | HEATING SEASON(183) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 24 | 5 | 0 | 1 | 0 | 0 | 0 | 0 | | 18 | 5 | 0 | 1 | 0 | 0 | 0 | 0 |

HAVRE, 1977

| YEAR ROUND(279) | | | | | | | | | HEATING SEASON(160) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 22 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | | 12 | 3 | 2 | 1 | 0 | 0 | 0 | 0 |

HELENA, 1977

| YEAR ROUND(318) | | | | | | | | | HEATING SEASON(214) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 19 | 11 | 1 | 0 | 1 | 0 | 0 | 0 | | 17 | 8 | 1 | 0 | 1 | 0 | 0 | 0 |

KALISPELL, 1977

| YEAR ROUND(290) | | | | | | | | | HEATING SEASON(178) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 31 | 0 | 5 | 2 | 0 | 0 | 0 | 0 | | 24 | 0 | 5 | 2 | 0 | 0 | 0 | 0 |

LEWISTOWN, 1977

| YEAR ROUND(298) | | | | | | | | | HEATING SEASON(184) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 23 | 5 | 0 | 1 | 0 | 0 | 0 | 0 | 15 | 5 | 0 | 1 | 0 | 0 | 0 | 0 |

LIBBY, 1977

| YEAR ROUND(224) | | | | | | | | | HEATING SEASON(131) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 13 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |

MILES CITY, 1977

| YEAR ROUND(309) | | | | | | | | | HEATING SEASON(208) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 25 | 7 | 1 | 1 | 0 | 0 | 0 | 0 | 18 | 7 | 1 | 1 | 0 | 0 | 0 | 0 |

MISSOULA, 1977

| YEAR ROUND(317) | | | | | | | | | HEATING SEASON(193) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 18 | 7 | 2 | 1 | 1 | 0 | 0 | 1 | 14 | 6 | 1 | 1 | 1 | 0 | 0 | 1 |

POLSON, 1977

| YEAR ROUND(315) | | | | | | | | | HEATING SEASON(181) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 23 | 6 | 4 | 0 | 1 | 0 | 0 | 0 | 18 | 6 | 3 | 0 | 1 | 0 | 0 | 0 |

WEST YELLOWSTONE, 1977

| YEAR ROUND(271) | | | | | | | | | HEATING SEASON(180) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 16 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 13 | 3 | 1 | 0 | 0 | 0 | 0 | 0 |

ANACONDA, 1978

| YEAR ROUND(221) | | | | | | | | | HEATING SEASON(129) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 11 | 7 | 4 | 0 | 0 | 0 | 0 | 0 | 8 | 7 | 2 | 0 | 0 | 0 | 0 | 0 |

BILLINGS, 1978

| YEAR ROUND(337) | | | | | | | | | HEATING SEASON(218) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 16 | 9 | 2 | 1 | 1 | 0 | 0 | 0 | 11 | 9 | 2 | 1 | 1 | 0 | 0 | 0 |

BOZEMAN, 1978

| YEAR ROUND(350) | | | | | | | | | HEATING SEASON(220) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 12 | 9 | 6 | 0 | 0 | 0 | 0 | 0 | 8 | 9 | 5 | 0 | 0 | 0 | 0 | 0 |

BROWNING, 1978

| YEAR ROUND(287) | | | | | | | | | HEATING SEASON(154) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 20 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 12 | 3 | 2 | 0 | 0 | 0 | 0 | 0 |

BUTTE, 1978

| YEAR ROUND(199) | | | | | | | | | HEATING SEASON(199) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 20 | 6 | 3 | 0 | 1 | 0 | 0 | 0 | 20 | 6 | 3 | 0 | 1 | 0 | 0 | 0 |

CHOTEAU, 1978

| YEAR ROUND(267) | | | | | | | | | HEATING SEASON(150) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 22 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 15 | 2 | 2 | 0 | 0 | 0 | 1 | 0 |

COLSTRIP, 1978

| YEAR ROUND(254) | | | | | | | | | HEATING SEASON(130) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 10 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |

DILLON, 1978

| YEAR ROUND(331) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 16 | 4 | 2 | 0 | 0 | 0 | 0 | 0 |

| HEATING SEASON(212) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| 14 | 4 | 2 | 0 | 0 | 0 | 0 | 0 |

ENNIS, 1978

| YEAR ROUND(208) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 9 | 4 | 2 | 0 | 0 | 0 | 0 | 0 |

| HEATING SEASON(165) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| 8 | 4 | 2 | 0 | 0 | 0 | 0 | 0 |

FORT BENTON, 1978

| YEAR ROUND(240) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 17 | 6 | 1 | 1 | 0 | 0 | 0 | 0 |

| HEATING SEASON(154) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| 15 | 5 | 1 | 1 | 0 | 0 | 0 | 0 |

GLASGOW, 1978

| YEAR ROUND(345) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 27 | 6 | 2 | 0 | 0 | 0 | 0 | 0 |

| HEATING SEASON(217) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| 23 | 6 | 1 | 0 | 0 | 0 | 0 | 0 |

GLENDIVE, 1978

| YEAR ROUND(279) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 23 | 4 | 1 | 1 | 0 | 0 | 1 | 0 |

| HEATING SEASON(185) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| 21 | 2 | 1 | 1 | 0 | 0 | 1 | 0 |

GREAT FALLS, 1978

| YEAR ROUND(343) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 24 | 5 | 4 | 1 | 0 | 0 | 0 | 0 |

| HEATING SEASON(215) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| 19 | 5 | 3 | 1 | 0 | 0 | 0 | 0 |

HAMILTON, 1978

| YEAR ROUND(227) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 15 | 9 | 3 | 3 | 2 | 0 | 0 | 0 |

| HEATING SEASON(210) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| 14 | 9 | 2 | 3 | 2 | 0 | 0 | 0 |

HARLOWTON, 1978

| YEAR ROUND(226) | | | | | | | | | HEATING SEASON(124) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 12 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 9 | 2 | 1 | 1 | 0 | 0 | 0 | 0 |

HAVRE, 1978

| YEAR ROUND(304) | | | | | | | | | HEATING SEASON(214) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 28 | 9 | 2 | 1 | 1 | 0 | 0 | 0 | 23 | 9 | 1 | 1 | 1 | 0 | 0 | 0 |

HELENA, 1978

| YEAR ROUND(353) | | | | | | | | | HEATING SEASON(223) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 22 | 6 | 4 | 1 | 0 | 0 | 0 | 0 | 18 | 6 | 3 | 1 | 0 | 0 | 0 | 0 |

KALISPELL, 1978

| YEAR ROUND(360) | | | | | | | | | HEATING SEASON(228) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 31 | 6 | 5 | 3 | 0 | 1 | 0 | 0 | 21 | 6 | 5 | 3 | 0 | 1 | 0 | 0 |

LEWISTOWN, 1978

| YEAR ROUND(258) | | | | | | | | | HEATING SEASON(168) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 19 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 16 | 3 | 2 | 0 | 0 | 0 | 0 | 0 |

LIBBY, 1978

| YEAR ROUND(303) | | | | | | | | | HEATING SEASON(182) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 26 | 6 | 1 | 0 | 1 | 1 | 0 | 0 | 17 | 6 | 1 | 0 | 1 | 1 | 0 | 0 |

LIVINGSTON, 1978

| YEAR ROUND(209) | | | | | | | | | HEATING SEASON(128) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 11 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |

MILES CITY, 1978

| YEAR ROUND(313) | | | | | | | | | HEATING SEASON(228) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 24 | 4 | 4 | 0 | 1 | 0 | 0 | 0 | | 23 | 3 | 3 | 0 | 1 | 0 | 0 | 0 |

MISSOULA, 1978

| YEAR ROUND(344) | | | | | | | | | HEATING SEASON(212) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 23 | 5 | 5 | 2 | 1 | 0 | 1 | 0 | | 12 | 5 | 4 | 2 | 1 | 0 | 1 | 0 |

PLENTYWOOD, 1978

| YEAR ROUND(281) | | | | | | | | | HEATING SEASON(167) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 15 | 7 | 0 | 1 | 2 | 0 | 0 | 0 | | 13 | 5 | 0 | 1 | 2 | 0 | 0 | 0 |

POLSON, 1978

| YEAR ROUND(361) | | | | | | | | | HEATING SEASON(231) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 21 | 6 | 2 | 4 | 1 | 2 | 1 | 0 | | 14 | 6 | 2 | 3 | 1 | 2 | 1 | 0 |

RED LODGE, 1978

| YEAR ROUND(302) | | | | | | | | | HEATING SEASON(177) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 13 | 7 | 2 | 0 | 0 | 0 | 0 | 0 | | 9 | 5 | 2 | 0 | 0 | 0 | 0 | 0 |

THOMPSON FALLS, 1978

| YEAR ROUND(238) | | | | | | | | | HEATING SEASON(164) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 17 | 5 | 3 | 3 | 2 | 0 | 0 | 0 | | 13 | 4 | 3 | 3 | 2 | 0 | 0 | 0 |

WEST YELLOWSTONE, 1978

| YEAR ROUND(297) | | | | | | | | | HEATING SEASON(216) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOUDY DAYS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 |
| OCCURENCES | 11 | 5 | 5 | 1 | 0 | 0 | 1 | 0 | | 9 | 5 | 5 | 1 | 0 | 0 | 1 | 0 |

# CLIMATOLOGICAL DATA

alphabetically by station

CLIMATOLOGICAL DATA FOR

ANACONDA

LAT: 46.12 LONG: 112.95 ELEV: 1620(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -5.4 | -2.9 | -1.4 | 4.2 | 9.3 | 13.1 | 18.7 | 17.8 | 12.4 | 7.2 | .1 | -3.4 |
| DAILY MAXIMUM | -1.6 | .4 | 3.9 | 9.7 | 15.3 | 19.9 | 26.1 | 24.9 | 18.7 | 12.0 | 4.2 | .2 |
| DAILY MINIMUM | -9.6 | -8.3 | -5.8 | -.9 | 3.4 | 7.3 | 11.5 | 10.5 | 6.2 | 1.6 | -4.0 | -7.4 |
| EXTREME MAXIMUM | 12.2 | 14.4 | 19.4 | 28.9 | 32.2 | 35.0 | 37.2 | 37.8 | 33.3 | 27.8 | 21.7 | 15.0 |
| EXTREME MINIMUM | -34.4 | -37.2 | -27.8 | -22.8 | -8.3 | -4.4 | .0 | -2.2 | -15.0 | -22.2 | -31.7 | -33.9 |
| HEATING DEGREE DAYS(18C) | 735 | 595 | 613 | 425 | 278 | 163 | 40 | 62 | 191 | 346 | 548 | 675 |

CLIMATOLOGICAL DATA FOR

ANACONDA

LAT: 46.12 LONG: 112.95 ELEV: 5331(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 22.3 | 26.7 | 29.4 | 39.5 | 48.8 | 55.6 | 65.6 | 64.1 | 54.4 | 44.9 | 32.1 | 25.8 |
| DAILY MAXIMUM | 29.2 | 32.8 | 39.0 | 49.5 | 59.5 | 67.8 | 79.0 | 76.9 | 65.7 | 53.6 | 39.5 | 32.3 |
| DAILY MINIMUM | 14.7 | 17.0 | 21.5 | 30.3 | 38.1 | 45.1 | 52.7 | 50.9 | 43.1 | 34.8 | 24.8 | 18.6 |
| EXTREME MAXIMUM | 54.0 | 58.0 | 67.0 | 84.0 | 90.0 | 95.0 | 99.0 | 100.0 | 92.0 | 82.0 | 71.0 | 59.0 |
| EXTREME MINIMUM | -30.0 | -35.0 | -18.0 | -9.0 | 17.0 | 24.0 | 32.0 | 28.0 | 5.0 | -8.0 | -25.0 | -29.0 |
| HEATING DEGREE DAYS(65F) | 1324 | 1072 | 1104 | 765 | 502 | 294 | 72 | 112 | 344 | 623 | 987 | 1215 |

CLIMATOLOGICAL DATA FOR

BILLINGS

LAT: 45.78 LONG: 108.50 ELEV: 947(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -4.9 | -1.3 | 1.6 | 8.3 | 13.4 | 17.3 | 21.9 | 20.8 | 15.1 | 9.8 | 2.4 | -2.3 |
| DAILY MAXIMUM | 2.3 | 5.1 | 9.0 | 16.8 | 21.9 | 25.4 | 31.4 | 30.6 | 24.9 | 18.6 | 9.2. | 5.2 |
| DAILY MINIMUM | -11.4 | -9.6 | -5.7 | -.1 | 5.1 | 8.9 | 12.3 | 10.7 | 5.7 | .9 | -4.9 | -8.3 |
| EXTREME MAXIMUM | 22.2 | 22.8 | 26.7 | 32.2 | 35.0 | 37.8 | 42.2 | 39.4 | 37.2 | 32.2 | 22.8 | 22.8 |
| EXTREME MINIMUM | -37.2 | -35.0 | -29.4 | -13.9 | -10.0 | -1.1 | 3.9 | .0 | -5.0 | -10.6 | -33.3 | -30.6 |
| HEATING DEGREE DAYS(18C) | 720 | 548 | 518 | 301 | 160 | 67 | 6 | 12 | 122 | 263 | 476 | 640 |

CLIMATOLOGICAL DATA FOR

BILLINGS

LAT: 45.78 LONG: 108.50 ELEV: 3117(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 23.2 | 29.7 | 34.9 | 46.9 | 56.1 | 63.2 | 71.4 | 69.5 | 59.1 | 49.7 | 36.4 | 27.8 |
| DAILY MAXIMUM | 36.1 | 41.1 | 48.2 | 62.3 | 71.4 | 77.8 | 88.6 | 87.0 | 76.9 | 65.5 | 48.5 | 41.3 |
| DAILY MINIMUM | 11.5 | 14.8 | 21.7 | 31.9 | 41.2 | 48.1 | 54.1 | 51.2 | 42.2 | 33.6 | 23.2 | 17.0 |
| EXTREME MAXIMUM | 72.0 | 73.0 | 80.0 | 90.0 | 95.0 | 100.0 | 108.0 | 103.0 | 99.0 | 90.0 | 73.0 | 73.0 |
| EXTREME MINIMUM | -35.0 | -31.0 | -21.0 | 7.0 | 14.0 | 30.0 | 39.0 | 32.0 | 23.0 | 13.0 | -28.0 | -23.0 |
| HEATING DEGREE DAYS(65F) | 1296 | 988 | 933 | 543 | 288 | 121 | 11 | 23 | 221 | 474 | 858 | 1153 |

CLIMATOLOGICAL DATA FOR

BOZEMAN

LAT: 45.67 LONG: 111.03 ELEV: 1445(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -6.4 | -3.4 | -1.0 | 5.6 | 10.5 | 14.2 | 19.1 | 18.3 | 13.1 | 7.8 | .1 | -3.8 |
| DAILY MAXIMUM | -.7 | 2.1 | 5.0 | 12.1 | 17.4 | 21.2 | 27.5 | 26.8 | 20.8 | 14.8 | 5.8 | 1.6 |
| DAILY MINIMUM | -12.2 | -9.0 | -7.1 | -.9 | 3.6 | 7.2 | 10.6 | 9.7 | 5.3 | .8 | -5.6 | -9.2 |
| EXTREME MAXIMUM | 14.4 | 16.7 | 21.1 | 27.2 | 31.7 | 32.8 | 36.7 | 37.2 | 35.0 | 27.8 | 21.1 | 15.0 |
| EXTREME MINIMUM | -37.8 | -33.9 | -30.6 | -16.7 | -8.9 | -3.3 | .0 | -1.7 | -8.9 | -12.8 | -32.2 | -33.9 |
| HEATING DEGREE DAYS(18C) | 762 | 614 | 596 | 377 | 238 | 128 | 25 | 38 | 160 | 322 | 542 | 682 |

CLIMATOLOGICAL DATA FOR

BOZEMAN

LAT: 45.67 LONG: 111.03 ELEV: 4754(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 20.4 | 25.9 | 30.2 | 42.1 | 50.9 | 57.6 | 66.3 | 64.9 | 55.6 | 46.1 | 32.2 | 25.2 |
| DAILY MAXIMUM | 30.7 | 35.8 | 41.0 | 53.7 | 63.3 | 70.2 | 81.5 | 80.3 | 69.5 | 58.7 | 42.4 | 34.9 |
| DAILY MINIMUM | 10.1 | 15.8 | 19.2 | 30.4 | 38.5 | 44.9 | 51.1 | 49.4 | 41.5 | 33.4 | 21.9 | 15.5 |
| EXTREME MAXIMUM | 58.0 | 62.0 | 70.0 | 81.0 | 89.0 | 91.0 | 98.0 | 99.0 | 95.0 | 82.0 | 70.0 | 59.0 |
| EXTREME MINIMUM | -36.0 | -29.0 | -23.0 | 2.0 | 16.0 | 26.0 | 32.0 | 29.0 | 16.0 | 9.0 | -26.0 | -29.0 |
| HEATING DEGREE DAYS(65F) | 1372 | 1106 | 1074 | 680 | 429 | 232 | 45 | 70 | 288 | 581 | 976 | 1229 |

CLIMATOLOGICAL DATA FOR

BROWNING

LAT: 48.55 LONG: 113.02 ELEV: 1356(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -7.8 | -4.7 | -2.8 | 3.7 | 9.0 | 12.6 | 16.8 | 15.8 | 11.3 | 6.7 | -.7 | -4.7 |
| DAILY MAXIMUM | -1.7 | -.5 | 3.4 | 10.6 | 16.4 | 20.0 | 25.6 | 24.4 | 18.5 | 12.6 | 4.5 | .4 |
| DAILY MINIMUM | -13.1 | -12.2 | -8.8 | -2.8 | 1.8 | 5.1 | 7.6 | 6.5 | 2.8 | -1.1 | -6.9 | -10.3 |
| EXTREME MAXIMUM | 18.9 | 20.0 | 22.2 | 32.8 | 33.9 | 36.7 | 37.2 | 36.7 | 34.4 | 28.3 | 22.2 | 20.6 |
| EXTREME MINIMUM | -48.9 | -43.3 | -38.9 | -25.6 | -17.2 | -6.1 | -4.4 | -5.0 | -17.8 | -27.2 | -39.4 | -43.9 |
| HEATING DEGREE DAYS(18C) | 809 | 643 | 654 | 438 | 289 | 175 | 61 | 92 | 219 | 360 | 571 | 715 |

CLIMATOLOGICAL DATA FOR

BROWNING

LAT: 48.55 LONG: 113.02 ELEV: 4462(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 18.0 | 23.6 | 27.0 | 38.7 | 48.2 | 54.7 | 62.3 | 60.5 | 52.3 | 44.1 | 30.7 | 23.5 |
| DAILY MAXIMUM | 29.0 | 31.1 | 38.1 | 51.0 | 61.5 | 68.0 | 78.0 | 76.0 | 65.3 | 54.6 | 40.1 | 32.8 |
| DAILY MINIMUM | 8.4 | 10.1 | 16.2 | 26.9 | 35.3 | 41.2 | 45.6 | 43.7 | 37.0 | 30.1 | 19.5 | 13.4 |
| EXTREME MAXIMUM | 66.0 | 68.0 | 72.0 | 91.0 | 93.0 | 98.0 | 99.0 | 98.0 | 94.0 | 83.0 | 72.0 | 69.0 |
| EXTREME MINIMUM | -56.0 | -46.0 | -38.0 | -14.0 | 1.0 | 21.0 | 24.0 | 23.0 | .0 | -17.0 | -39.0 | -47.0 |
| HEATING DEGREE DAYS(65F) | 1457 | 1159 | 1178 | 789 | 521 | 315 | 111 | 167 | 395 | 648 | 1029 | 1287 |

CLIMATOLOGICAL DATA FOR

BUTTE

LAT: 46.00 LONG: 112.50 ELEV: 1749(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -9.4 | -6.2 | -3.6 | 3.2 | 8.2 | 12.2 | 16.8 | 15.7 | 10.3 | 5.1 | -2.3 | -7.1 |
| DAILY MAXIMUM | -2.3 | .4 | 3.9 | 10.5 | 15.9 | 19.9 | 26.7 | 25.6 | 19.7 | 13.5 | 4.6 | .3 |
| DAILY MINIMUM | -16.9 | -14.7 | -10.2 | -3.5 | .8 | 4.5 | 7.3 | 5.8 | 1.6 | -2.9 | -9.4 | -13.5 |
| EXTREME MAXIMUM | 12.2 | 15.6 | 17.8 | 26.1 | 31.1 | 33.9 | 37.8 | 37.2 | 32.8 | 28.3 | 20.0 | 16.7 |
| EXTREME MINIMUM | -44.4 | -46.7 | -37.8 | -25.0 | -11.1 | -5.0 | -1.7 | -3.3 | -11.1 | -28.3 | -41.1 | -38.3 |
| HEATING DEGREE DAYS(18C) | 859 | 686 | 678 | 455 | 313 | 187 | 66 | 92 | 242 | 411 | 618 | 788 |

CLIMATOLOGICAL DATA FOR

BUTTE

LAT: 46.00 LONG: 112.50 ELEV: 5755(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 15.1 | 20.9 | 25.6 | 37.7 | 46.8 | 53.9 | 62.2 | 60.3 | 50.6 | 41.1 | 27.9 | 19.2 |
| DAILY MAXIMUM | 27.8 | 32.7 | 39.1 | 50.9 | 60.7 | 67.9 | 80.0 | 78.0 | 67.5 | 56.3 | 40.3 | 32.5 |
| DAILY MINIMUM | 1.5 | 5.5 | 13.7 | 25.7 | 33.5 | 40.1 | 45.1 | 42.5 | 34.8 | 26.8 | 15.0 | 7.7 |
| EXTREME MAXIMUM | 54.0 | 60.0 | 64.0 | 79.0 | 88.0 | 93.0 | 100.0 | 99.0 | 91.0 | 83.0 | 68.0 | 62.0 |
| EXTREME MINIMUM | -48.0 | -52.0 | -36.0 | -13.0 | 12.0 | 23.0 | 29.0 | 26.0 | 12.0 | -19.0 | -42.0 | -37.0 |
| HEATING DEGREE DAYS(65F) | 1547 | 1235 | 1221 | 819 | 564 | 337 | 119 | 166 | 437 | 741 | 1113 | 1420 |

CLIMATOLOGICAL DATA FOR

CHOTEAU

LAT: 47.82 LONG: 112.20 ELEV: 1155(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -6.1 | -2.9 | -.8 | 5.7 | 10.9 | 14.8 | 19.1 | 18.0 | 12.8 | 8.3 | 1.0 | -3.1 |
| DAILY MAXIMUM | .7 | 2.6 | 6.6 | 12.9 | 18.6 | 22.4 | 28.2 | 27.1 | 20.9 | 15.5 | 7.4 | 3.6 |
| DAILY MINIMUM | -13.2 | -11.8 | -7.7 | -2.2 | 2.7 | 6.8 | 9.6 | 7.9 | 3.7 | -.5 | -6.6 | -9.6 |
| EXTREME MAXIMUM | 18.9 | 21.1 | 27.8 | 29.4 | 33.3 | 36.1 | 40.6 | 41.1 | 35.6 | 30.6 | 25.0 | 22.2 |
| EXTREME MINIMUM | -42.2 | -45.6 | -37.8 | -26.7 | -13.3 | -2.2 | .6 | -1.7 | -20.6 | -26.1 | -34.4 | -38.9 |
| HEATING DEGREE DAYS(18C) | 756 | 595 | 594 | 378 | 230 | 117 | 26 | 47 | 177 | 310 | 520 | 665 |

CLIMATOLOGICAL DATA FOR

CHOTEAU

LAT: 47.82 LONG: 112.20 ELEV: 3800(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 21.1 | 26.7 | 30.5 | 42.3 | 51.6 | 58.7 | 66.3 | 64.4 | 55.0 | 47.0 | 33.8 | 26.4 |
| DAILY MAXIMUM | 33.2 | 36.6 | 43.8 | 55.2 | 65.4 | 72.3 | 82.7 | 80.8 | 69.6 | 59.9 | 45.4 | 38.4 |
| DAILY MINIMUM | 8.2 | 10.8 | 18.2 | 28.0 | 36.9 | 44.2 | 49.2 | 46.3 | 38.7 | 31.1 | 20.1 | 14.8 |
| EXTREME MAXIMUM | 66.0 | 70.0 | 82.0 | 85.0 | 92.0 | 97.0 | 105.0 | 106.0 | 96.0 | 87.0 | 77.0 | 72.0 |
| EXTREME MINIMUM | -44.0 | -50.0 | -36.0 | -16.0 | 8.0 | 28.0 | 33.0 | 29.0 | -5.0 | -15.0 | -30.0 | -38.0 |
| HEATING DEGREE DAYS(65F) | 1361 | 1072 | 1070 | 681 | 415 | 212 | 47 | 85 | 320 | 558 | 936 | 1197 |

CLIMATOLOGICAL DATA FOR

COLSTRIP

LAT: 45.88 LONG: 106.63 ELEV: 772(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -6.1 | -2.8 | .2 | 7.1 | 12.4 | 17.1 | 21.9 | 21.2 | 15.0 | 9.2 | 1.3 | -3.6 |
| DAILY MAXIMUM | 1.2 | 4.3 | 7.7 | 15.2 | 20.7 | 25.3 | 31.8 | 31.2 | 24.4 | 18.2 | 8.6 | 3.4 |
| DAILY MINIMUM | -13.5 | -10.1 | -7.3 | -1.1 | 4.1 | 8.7 | 12.1 | 11.2 | 5.6 | .2 | -6.1 | -10.7 |
| EXTREME MAXIMUM | 19.4 | 21.1 | 26.7 | 30.6 | 35.6 | 38.9 | 41.7 | 43.9 | 38.9 | 34.4 | 26.1 | 21.7 |
| EXTREME MINIMUM | -40.0 | -35.0 | -33.3 | -16.1 | -10.6 | -2.2 | 1.1 | .6 | -7.8 | -13.9 | -35.6 | -37.2 |
| HEATING DEGREE DAYS(18C) | 753 | 585 | 556 | 346 | 177 | 58 | 6 | 13 | 112 | 277 | 508 | 667 |

CLIMATOLOGICAL DATA FOR

COLSTRIP

LAT: 45.88 LONG: 106.63 ELEV: 2540(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 21.0 | 26.9 | 32.3 | 44.7 | 54.3 | 62.7 | 71.5 | 70.1 | 59.0 | 48.6 | 34.3 | 25.5 |
| DAILY MAXIMUM | 34.2 | 39.8 | 45.8 | 59.3 | 69.2 | 77.6 | 89.2 | 88.1 | 75.9 | 64.8 | 47.5 | 38.2 |
| DAILY MINIMUM | 7.7 | 13.9 | 18.9 | 30.1 | 39.4 | 47.7 | 53.8 | 52.1 | 42.0 | 32.4 | 21.1 | 12.8 |
| EXTREME MAXIMUM | 67.0 | 70.0 | 80.0 | 87.0 | 96.0 | 102.0 | 107.0 | 111.0 | 102.0 | 94.0 | 79.0 | 71.0 |
| EXTREME MINIMUM | -40.0 | -31.0 | -28.0 | 3.0 | 13.0 | 28.0 | 34.0 | 33.0 | 18.0 | 7.0 | -32.0 | -35.0 |
| HEATING DEGREE DAYS(65F) | 1356 | 1053 | 1001 | 624 | 319 | 105 | 12 | 24 | 203 | 500 | 915 | 1202 |

CLIMATOLOGICAL DATA FOR

DILLON

LAT: 45.25 LONG: 112.63 ELEV: 1537(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -5.4 | -2.6 | -.3 | 5.6 | 10.4 | 14.2 | 18.4 | 17.4 | 12.6 | 7.8 | .8 | -3.5 |
| DAILY MAXIMUM | 1.2 | 3.5 | 7.3 | 13.3 | 18.6 | 23.2 | 28.1 | 27.3 | 21.9 | 16.3 | 8.1 | 2.9 |
| DAILY MINIMUM | -11.3 | -9.3 | -5.8 | -1.2 | 2.7 | 5.9 | 8.7 | 7.3 | 2.9 | -.7 | -5.8 | -9.4 |
| EXTREME MAXIMUM | 15.6 | 18.3 | 23.3 | 28.9 | 32.8 | 34.4 | 37.2 | 37.8 | 33.9 | 30.0 | 26.1 | 18.3 |
| EXTREME MINIMUM | -37.8 | -40.0 | -32.2 | -18.3 | -9.4 | -3.9 | -1.1 | -3.9 | -12.8 | -25.0 | -35.0 | -37.2 |
| HEATING DEGREE DAYS(18C) | 737 | 585 | 577 | 381 | 246 | 130 | 27 | 55 | 177 | 325 | 525 | 676 |

CLIMATOLOGICAL DATA FOR

DILLON

LAT: 45.25 LONG: 112.63 ELEV: 5057(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 22.2 | 27.4 | 31.5 | 42.1 | 50.7 | 57.5 | 65.1 | 63.4 | 54.7 | 46.1 | 33.5 | 25.7 |
| DAILY MAXIMUM | 34.2 | 38.3 | 45.2 | 55.9 | 65.4 | 73.8 | 82.6 | 81.1 | 71.4 | 61.4 | 46.5 | 37.2 |
| DAILY MINIMUM | 11.7 | 15.3 | 21.5 | 29.9 | 36.9 | 42.7 | 47.7 | 45.1 | 37.2 | 30.7 | 21.5 | 15.1 |
| EXTREME MAXIMUM | 60.0 | 65.0 | 74.0 | 84.0 | 91.0 | 94.0 | 99.0 | 100.0 | 93.0 | 86.0 | 79.0 | 65.0 |
| EXTREME MINIMUM | -36.0 | -40.0 | -26.0 | -1.0 | 15.0 | 25.0 | 30.0 | 25.0 | 9.0 | -13.0 | -31.0 | -35.0 |
| HEATING DEGREE DAYS(65F) | 1327 | 1053 | 1039 | 687 | 443 | 235 | 50 | 100 | 319 | 586 | 945 | 1218 |

CLIMATOLOGICAL DATA FOR

ENNIS

LAT: 45.35 LONG: 111.73 ELEV: 1497(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -5.2 | -2.5 | -.4 | 5.4 | 10.2 | 13.9 | 18.2 | 17.3 | 12.3 | 7.7 | 1.0 | -2.9 |
| DAILY MAXIMUM | -.1 | 2.2 | 6.3 | 13.0 | 18.6 | 22.9 | 28.2 | 27.2 | 21.7 | 15.3 | 6.7 | 2.0 |
| DAILY MINIMUM | -11.3 | -9.6 | -6.5 | -2.1 | 2.1 | 5.7 | 8.5 | 7.2 | 3.1 | -.6 | -5.6 | -8.6 |
| EXTREME MAXIMUM | 14.4 | 16.7 | 24.4 | 27.8 | 34.4 | 36.1 | 37.8 | 36.1 | 33.3 | 30.0 | 21.7 | 20.0 |
| EXTREME MINIMUM | -41.7 | -41.7 | -33.9 | -21.7 | -9.4 | -4.4 | .0 | -2.8 | -11.1 | -23.3 | -32.8 | -38.3 |
| HEATING DEGREE DAYS(18C) | 730 | 583 | 580 | 386 | 251 | 138 | 37 | 52 | 186 | 330 | 520 | 657 |

CLIMATOLOGICAL DATA FOR

ENNIS

LAT: 45.35 LONG: 111.73 ELEV: 4927(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 22.6 | 27.5 | 31.3 | 41.8 | 50.4 | 57.0 | 64.7 | 63.1 | 54.1 | 45.8 | 33.8 | 26.8 |
| DAILY MAXIMUM | 31.8 | 36.0 | 43.4 | 55.4 | 65.5 | 73.3 | 82.8 | 81.0 | 71.0 | 59.5 | 44.0 | 35.6 |
| DAILY MINIMUM | 11.6 | 14.7 | 20.3 | 28.3 | 35.8 | 42.3 | 47.3 | 44.9 | 37.5 | 30.9 | 21.9 | 16.5 |
| EXTREME MAXIMUM | 58.0 | 62.0 | 76.0 | 82.0 | 94.0 | 97.0 | 100.0 | 97.0 | 92.0 | 86.0 | 71.0 | 68.0 |
| EXTREME MINIMUM | -43.0 | -43.0 | -29.0 | -7.0 | 15.0 | 24.0 | 32.0 | 27.0 | 12.0 | -10.0 | -27.0 | -37.0 |
| HEATING DEGREE DAYS(65F) | 1314 | 1050 | 1045 | 696 | 453 | 249 | 68 | 94 | 336 | 595 | 936 | 1184 |

CLIMATOLOGICAL DATA FOR

FORT BENTON

LAT: 47.80 LONG: 110.67 ELEV: 790(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -7.3 | -3.3 | -.1 | 7.3 | 12.8 | 16.7 | 20.9 | 20.0 | 14.1 | 8.8 | .9 | -4.3 |
| DAILY MAXIMUM | .1 | 1.6 | 6.6 | 15.4 | 20.2 | 23.8 | 29.6 | 28.5 | 22.6 | 17.1 | 7.2 | 3.1 |
| DAILY MINIMUM | -12.9 | -12.0 | -7.1 | -.3 | 4.9 | 9.2 | 11.9 | 10.5 | 5.7 | .7 | -5.6 | -9.4 |
| EXTREME MAXIMUM | 22.2 | 21.1 | 27.8 | 33.9 | 34.4 | 42.2 | 43.9 | 42.8 | 38.3 | 33.3 | 25.6 | 22.8 |
| EXTREME MINIMUM | -50.0 | -42.8 | -41.1 | -21.1 | -10.0 | -2.8 | -.6 | -2.8 | -12.8 | -21.1 | -37.8 | -50.6 |
| HEATING DEGREE DAYS(18C) | 806 | 605 | 571 | 330 | 176 | 78 | 8 | 18 | 140 | 294 | 523 | 701 |

CLIMATOLOGICAL DATA FOR

FORT BENTON

LAT: 47.80 LONG: 110.67 ELEV: 2600(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 18.8 | 26.1 | 31.8 | 45.2 | 55.0 | 62.0 | 69.7 | 68.0 | 57.3 | 47.9 | 33.6 | 24.3 |
| DAILY MAXIMUM | 32.1 | 34.9 | 43.9 | 59.7 | 68.4 | 74.9 | 85.3 | 83.3 | 72.7 | 62.7 | 45.0 | 37.6 |
| DAILY MINIMUM | 8.7 | 10.4 | 19.2 | 31.5 | 40.9 | 48.6 | 53.4 | 50.9 | 42.2 | 33.2 | 21.9 | 15.1 |
| EXTREME MAXIMUM | 72.0 | 70.0 | 82.0 | 93.0 | 94.0 | 108.0 | 111.0 | 109.0 | 101.0 | 92.0 | 78.0 | 73.0 |
| EXTREME MINIMUM | -58.0 | -45.0 | -42.0 | -6.0 | 14.0 | 27.0 | 31.0 | 27.0 | 9.0 | -6.0 | -36.0 | -59.0 |
| HEATING DEGREE DAYS(65F) | 1451 | 1089 | 1029 | 594 | 317 | 141 | 16 | 33 | 253 | 530 | 942 | 1262 |

CLIMATOLOGICAL DATA FOR

GLASGOW

LAT: 48.20 LONG: 106.63 ELEV: 636(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -11.9 | -9.7 | -2.0 | 6.9 | 13.1 | 17.6 | 22.3 | 20.5 | 14.0 | 7.5 | -2.2 | -9.0 |
| DAILY MAXIMUM | -6.9 | -4.6 | 3.0 | 13.2 | 20.2 | 24.4 | 30.4 | 28.6 | 21.4 | 14.4 | 3.3 | -3.9 |
| DAILY MINIMUM | -17.0 | -14.9 | -7.0 | .6 | 5.9 | 10.7 | 14.2 | 12.4 | 6.6 | .6 | -7.8 | -14.1 |
| EXTREME MAXIMUM | 16.1 | 15.0 | 25.6 | 33.9 | 38.9 | 36.1 | 42.2 | 42.2 | 38.9 | 35.6 | 21.1 | 17.8 |
| EXTREME MINIMUM | -45.6 | -36.1 | -33.9 | -20.0 | -8.9 | 2.2 | 3.9 | .6 | -6.1 | -13.9 | -29.4 | -35.0 |
| HEATING DEGREE DAYS(18C) | 938 | 785 | 630 | 343 | 183 | 72 | 8 | 18 | 145 | 336 | 616 | 847 |

CLIMATOLOGICAL DATA FOR

GLASGOW

LAT: 48.20 LONG: 106.63 ELEV: 2095(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 10.5 | 14.5 | 28.4 | 44.4 | 55.5 | 63.6 | 72.2 | 68.9 | 57.2 | 45.5 | 28.0 | 15.8 |
| DAILY MAXIMUM | 19.6 | 23.7 | 37.4 | 55.7 | 68.4 | 75.9 | 86.7 | 83.5 | 70.5 | 57.9 | 37.9 | 24.9 |
| DAILY MINIMUM | 1.4 | 5.2 | 19.4 | 33.0 | 42.6 | 51.2 | 57.6 | 54.3 | 43.8 | 33.1 | 18.0 | 6.6 |
| EXTREME MAXIMUM | 61.0 | 59.0 | 78.0 | 93.0 | 102.0 | 97.0 | 108.0 | 108.0 | 102.0 | 96.0 | 70.0 | 64.0 |
| EXTREME MINIMUM | -50.0 | -33.0 | -29.0 | -4.0 | 16.0 | 36.0 | 39.0 | 33.0 | 21.0 | 7.0 | -21.0 | -31.0 |
| HEATING DEGREE DAYS(65F) | 1690 | 1414 | 1135 | 618 | 330 | 131 | 15 | 34 | 262 | 605 | 1110 | 1525 |

CLIMATOLOGICAL DATA FOR

GLENDIVE

LAT: 47.12 LONG: 104.73 ELEV: 629(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -9.5 | -6.4 | -.9 | 8.0 | 14.3 | 18.8 | 23.3 | 22.3 | 15.7 | 9.7 | .6 | -5.6 |
| DAILY MAXIMUM | -3.7 | -1.8 | 5.2 | 15.5 | 21.8 | 26.4 | 31.8 | 30.7 | 23.8 | 16.7 | 6.1 | -.6 |
| DAILY MINIMUM | -16.1 | -14.8 | -8.1 | .3 | 6.1 | 11.3 | 14.6 | 12.8 | 6.7 | .6 | -6.6 | -12.5 |
| EXTREME MAXIMUM | 17.2 | 22.8 | 29.4 | 35.6 | 40.0 | 42.8 | 47.2 | 45.0 | 40.0 | 35.0 | 24.4 | 22.2 |
| EXTREME MINIMUM | -44.4 | -45.6 | -36.7 | -21.1 | -8.9 | -1.7 | 2.2 | .0 | -8.9 | -25.0 | -32.2 | -40.0 |
| HEATING DEGREE DAYS(18C) | 862 | 692 | 596 | 313 | 136 | 50 | 4 | 7 | 113 | 268 | 531 | 742 |

CLIMATOLOGICAL DATA FOR

GLENDIVE

LAT: 47.12 LONG: 104.73 ELEV: 2071(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 14.9 | 20.5 | 30.4 | 46.4 | 57.8 | 65.9 | 74.0 | 72.2 | 60.2 | 49.4 | 33.1 | 21.9 |
| DAILY MAXIMUM | 25.3 | 28.8 | 41.4 | 59.9 | 71.3 | 79.6 | 89.2 | 87.3 | 74.9 | 62.1 | 43.0 | 31.0 |
| DAILY MINIMUM | 3.0 | 5.3 | 17.4 | 32.5 | 43.0 | 52.3 | 58.2 | 55.0 | 44.1 | 33.0 | 20.2 | 9.5 |
| EXTREME MAXIMUM | 63.0 | 73.0 | 85.0 | 96.0 | 104.0 | 109.0 | 117.0 | 113.0 | 104.0 | 95.0 | 76.0 | 72.0 |
| EXTREME MINIMUM | -48.0 | -50.0 | -34.0 | -6.0 | 16.0 | 29.0 | 36.0 | 32.0 | 16.0 | -13.0 | -26.0 | -40.0 |
| HEATING DEGREE DAYS(65F) | 1553 | 1246 | 1073 | 564 | 246 | 90 | 8 | 13 | 204 | 484 | 957 | 1336 |

CLIMATOLOGICAL DATA FOR

GREAT FALLS

LAT: 47.52 LONG: 111.30 ELEV: 1012(M)

| TEMPERATURE AVERAGES BY MONTH | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *** DEGREES CELSIUS *** | | | | | | | | | | | | |
| DAILY AVERAGE | -6.4 | -3.0 | -.8 | 6.3 | 11.8 | 16.0 | 20.7 | 19.7 | 14.1 | 9.1 | 1.4 | -3.1 |
| DAILY MAXIMUM | -1.5 | 2.2 | 4.7 | 12.5 | 18.3 | 22.3 | 28.7 | 27.7 | 21.1 | 15.2 | 6.3 | 1.5 |
| DAILY MINIMUM | -11.3 | -8.2 | -6.3 | .2 | 5.3 | 9.7 | 12.7 | 11.7 | 7.0 | 2.8 | -3.5 | -7.7 |
| EXTREME MAXIMUM | 16.1 | 17.8 | 22.2 | 28.3 | 32.2 | 36.1 | 40.6 | 41.1 | 36.7 | 29.4 | 22.2 | 16.1 |
| EXTREME MINIMUM | -38.3 | -30.0 | -28.3 | -15.0 | -7.2 | .0 | 4.4 | 2.8 | -5.0 | -19.4 | -26.1 | -41.7 |
| HEATING DEGREE DAYS(18C) | 766 | 597 | 594 | 360 | 203 | 90 | 10 | 23 | 144 | 291 | 506 | 663 |

CLIMATOLOGICAL DATA FOR

GREAT FALLS

LAT: 47.52 LONG: 111.30 ELEV: 3330(FT)

| TEMPERATURE AVERAGES BY MONTH | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *** DEGREES FAHRENHEIT *** | | | | | | | | | | | | |
| DAILY AVERAGE | 20.5 | 26.6 | 30.5 | 43.4 | 53.3 | 60.8 | 69.3 | 67.4 | 57.3 | 48.3 | 34.6 | 26.5 |
| DAILY MAXIMUM | 29.3 | 35.9 | 40.4 | 54.5 | 65.0 | 72.1 | 83.7 | 81.8 | 70.0 | 59.4 | 43.4 | 34.7 |
| DAILY MINIMUM | 11.6 | 17.2 | 20.6 | 32.3 | 41.5 | 49.5 | 54.9 | 53.0 | 44.6 | 37.1 | 25.7 | 18.2 |
| EXTREME MAXIMUM | 61.0 | 64.0 | 72.0 | 83.0 | 90.0 | 97.0 | 105.0 | 106.0 | 98.0 | 85.0 | 72.0 | 61.0 |
| EXTREME MINIMUM | -37.0 | -22.0 | -19.0 | 5.0 | 19.0 | 32.0 | 40.0 | 37.0 | 23.0 | -3.0 | -15.0 | -43.0 |
| HEATING DEGREE DAYS(65F) | 1380 | 1075 | 1070 | 648 | 367 | 162 | 18 | 42 | 260 | 524 | 912 | 1194 |

CLIMATOLOGICAL DATA FOR

HAMILTON

LAT: 46.25 LONG: 114.15 ELEV: 1094(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -4.0 | -.4 | 2.3 | 7.6 | 11.9 | 15.4 | 19.7 | 18.6 | 13.7 | 8.1 | 1.6 | -2.3 |
| DAILY MAXIMUM | 1.3 | 4.1 | 9.2 | 15.6 | 20.2 | 23.9 | 29.6 | 28.4 | 22.3 | 15.6 | 7.6 | 2.6 |
| DAILY MINIMUM | -9.1 | -7.1 | -3.2 | .7 | 4.3 | 7.6 | 10.4 | 9.3 | 5.4 | .9 | -3.8 | -7.2 |
| EXTREME MAXIMUM | 16.7 | 21.7 | 23.3 | 32.2 | 38.9 | 37.8 | 39.4 | 38.9 | 36.7 | 32.2 | 22.2 | 18.9 |
| EXTREME MINIMUM | -37.8 | -39.4 | -25.6 | -17.2 | -7.8 | -1.7 | .6 | .0 | -7.8 | -18.3 | -31.1 | -34.4 |
| HEATING DEGREE DAYS(18C) | 692 | 525 | 496 | 321 | 201 | 95 | 15 | 36 | 148 | 318 | 503 | 638 |

CLIMATOLOGICAL DATA FOR

HAMILTON

LAT: 46.25 LONG: 114.15 ELEV: 3600(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 24.8 | 31.2 | 36.2 | 45.7 | 53.5 | 59.8 | 67.5 | 65.5 | 56.7 | 46.5 | 34.8 | 27.9 |
| DAILY MAXIMUM | 34.4 | 39.3 | 48.6 | 60.0 | 68.4 | 75.1 | 85.2 | 83.1 | 72.2 | 60.0 | 45.6 | 36.6 |
| DAILY MINIMUM | 15.7 | 19.2 | 26.2 | 33.2 | 39.7 | 45.7 | 50.8 | 48.8 | 41.7 | 33.6 | 25.2 | 19.1 |
| EXTREME MAXIMUM | 62.0 | 71.0 | 74.0 | 90.0 | 102.0 | 100.0 | 103.0 | 102.0 | 98.0 | 90.0 | 72.0 | 66.0 |
| EXTREME MINIMUM | -36.0 | -39.0 | -14.0 | 1.0 | 18.0 | 29.0 | 33.0 | 32.0 | 18.0 | -1.0 | -24.0 | -30.0 |
| HEATING DEGREE DAYS(65F) | 1246 | 946 | 893 | 579 | 362 | 171 | 27 | 66 | 267 | 574 | 906 | 1150 |

CLIMATOLOGICAL DATA FOR

HARLOWTON

LAT: 46.43 LONG: 109.83 ELEV: 1266(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -5.7 | -3.6 | -1.0 | 5.6 | 10.7 | 14.2 | 18.9 | 17.6 | 12.5 | 7.8 | .4 | -2.9 |
| DAILY MAXIMUM | .9 | 3.3 | 6.3 | 13.6 | 19.1 | 22.3 | 28.5 | 27.7 | 21.9 | 16.4 | 7.6 | 3.5 |
| DAILY MINIMUM | -12.3 | -10.6 | -8.3 | -2.4 | 2.3 | 6.1 | 9.2 | 7.4 | 3.1 | -.7 | -6.7 | -9.4 |
| EXTREME MAXIMUM | 17.2 | 23.3 | 24.4 | 30.6 | 33.9 | 35.0 | 38.9 | 38.3 | 36.1 | 32.8 | 25.6 | 20.6 |
| EXTREME MINIMUM | -38.9 | -39.4 | -34.4 | -22.2 | -15.6 | -4.4 | .6 | -1.7 | -12.2 | -15.0 | -33.9 | -39.4 |
| HEATING DEGREE DAYS(18C) | 745 | 601 | 604 | 394 | 235 | 115 | 25 | 45 | 177 | 311 | 533 | 658 |

CLIMATOLOGICAL DATA FOR

HARLOWTON

LAT: 46.43 LONG: 109.83 ELEV: 4167(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 21.7 | 25.5 | 30.2 | 42.1 | 51.3 | 57.6 | 66.0 | 63.6 | 54.5 | 46.1 | 32.8 | 26.7 |
| DAILY MAXIMUM | 33.6 | 38.0 | 43.4 | 56.5 | 66.4 | 72.2 | 83.3 | 81.8 | 71.4 | 61.5 | 45.6 | 38.3 |
| DAILY MINIMUM | 9.8 | 12.9 | 17.0 | 27.7 | 36.2 | 43.0 | 48.6 | 45.3 | 37.5 | 30.7 | 20.0 | 15.0 |
| EXTREME MAXIMUM | 63.0 | 74.0 | 76.0 | 87.0 | 93.0 | 95.0 | 102.0 | 101.0 | 97.0 | 91.0 | 78.0 | 69.0 |
| EXTREME MINIMUM | -38.0 | -39.0 | -30.0 | -8.0 | 4.0 | 24.0 | 33.0 | 29.0 | 10.0 | 5.0 | -29.0 | -39.0 |
| HEATING DEGREE DAYS(65F) | 1342 | 1083 | 1088 | 710 | 424 | 207 | 46 | 82 | 319 | 561 | 961 | 1186 |

CLIMATOLOGICAL DATA FOR

HAVRE

LAT: 48.57 LONG: 109.67 ELEV: 755(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -8.8 | -7.3 | -.9 | 7.3 | 13.2 | 17.2 | 21.8 | 20.0 | 13.9 | 8.2 | -.6 | -6.4 |
| DAILY MAXIMUM | -3.2 | -1.3 | 5.0 | 14.2 | 20.4 | 24.0 | 29.9 | 28.3 | 21.7 | 15.4 | 5.3 | -.9 |
| DAILY MINIMUM | -14.4 | -13.3 | -6.9 | .3 | 5.9 | 10.3 | 13.7 | 11.7 | 6.1 | .9 | -6.6 | -12.1 |
| EXTREME MAXIMUM | 18.3 | 21.7 | 25.0 | 35.0 | 36.7 | 41.7 | 41.7 | 41.1 | 36.7 | 32.8 | 23.3 | 21.7 |
| EXTREME MINIMUM | -49.4 | -44.4 | -35.6 | -22.2 | -10.0 | -1.7 | 2.8 | -2.8 | -7.8 | -21.7 | -33.3 | -37.8 |
| HEATING DEGREE DAYS(18C) | 840 | 717 | 597 | 331 | 173 | 69 | 11 | 21 | 150 | 313 | 568 | 768 |

CLIMATOLOGICAL DATA FOR

HAVRE

LAT: 48.57 LONG: 109.67 ELEV: 2486(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 16.2 | 18.9 | 30.3 | 45.1 | 55.7 | 62.9 | 71.3 | 68.0 | 57.0 | 46.8 | 30.9 | 20.4 |
| DAILY MAXIMUM | 26.3 | 29.6 | 41.0 | 57.6 | 68.8 | 75.2 | 85.9 | 82.9 | 71.0 | 59.8 | 41.5 | 30.4 |
| DAILY MINIMUM | 6.1 | 8.1 | 19.5 | 32.5 | 42.6 | 50.6 | 56.6 | 53.1 | 42.9 | 33.7 | 20.2 | 10.3 |
| EXTREME MAXIMUM | 65.0 | 71.0 | 77.0 | 95.0 | 98.0 | 107.0 | 107.0 | 106.0 | 98.0 | 91.0 | 74.0 | 71.0 |
| EXTREME MINIMUM | -57.0 | -48.0 | -32.0 | -8.0 | 14.0 | 29.0 | 37.0 | 27.0 | 18.0 | -7.0 | -28.0 | -36.0 |
| HEATING DEGREE DAYS(65F) | 1513 | 1291 | 1076 | 597 | 313 | 125 | 20 | 38 | 270 | 564 | 1023 | 1383 |

CLIMATOLOGICAL DATA FOR

HELENA

LAT: 46.58 LONG: 112.03 ELEV: 1253(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -7.4 | -4.9 | -.3 | 6.3 | 11.6 | 15.3 | 20.2 | 19.0 | 13.3 | 7.6 | -.2 | -4.3 |
| DAILY MAXIMUM | -1.8 | .9 | 5.8 | 13.4 | 18.8 | 22.4 | 29.1 | 27.9 | 21.6 | 14.9 | 5.8 | 1.2 |
| DAILY MINIMUM | -13.1 | -10.7 | -6.6 | -.8 | 4.4 | 8.1 | 11.3 | 10.1 | 5.1 | .2 | -6.2 | -9.9 |
| EXTREME MAXIMUM | 10.0 | 15.6 | 21.1 | 24.4 | 30.0 | 31.1 | 35.0 | 35.0 | 32.8 | 29.4 | 19.4 | 15.0 |
| EXTREME MINIMUM | -21.7 | -23.9 | -26.7 | -11.1 | -2.8 | 2.2 | 5.6 | 4.4 | -7.2 | -6.1 | -19.4 | -38.9 |
| HEATING DEGREE DAYS(18C) | 798 | 650 | 578 | 361 | 211 | 108 | 17 | 32 | 163 | 333 | 556 | 702 |

CLIMATOLOGICAL DATA FOR

HELENA

LAT: 46.58 LONG: 112.03 ELEV: 4124(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 18.6 | 23.2 | 31.4 | 43.3 | 52.9 | 59.5 | 68.4 | 66.2 | 56.0 | 45.6 | 31.6 | 24.2 |
| DAILY MAXIMUM | 28.8 | 33.7 | 42.5 | 56.1 | 65.8 | 72.3 | 84.4 | 82.2 | 70.8 | 58.8 | 42.4 | 34.2 |
| DAILY MINIMUM | 8.4 | 12.7 | 20.2 | 30.5 | 39.9 | 46.6 | 52.3 | 50.1 | 41.2 | 32.3 | 20.8 | 14.2 |
| EXTREME MAXIMUM | 50.0 | 60.0 | 70.0 | 76.0 | 86.0 | 88.0 | 95.0 | 95.0 | 91.0 | 85.0 | 67.0 | 59.0 |
| EXTREME MINIMUM | -7.0 | -11.0 | -16.0 | 12.0 | 27.0 | 36.0 | 42.0 | 40.0 | 19.0 | 21.0 | -3.0 | -38.0 |
| HEATING DEGREE DAYS(65F) | 1438 | 1170 | 1042 | 651 | 381 | 195 | 31 | 59 | 294 | 601 | 1002 | 1265 |

CLIMATOLOGICAL DATA FOR

JORDAN

LAT: 47.32 LONG: 106.90 ELEV: 851(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -9.5 | -5.8 | -1.3 | 6.9 | 12.8 | 17.5 | 22.3 | 21.2 | 14.6 | 8.5 | -.1 | -6.0 |
| DAILY MAXIMUM | -2.2 | -.2 | 6.2 | 15.0 | 21.1 | 25.9 | 32.4 | 30.9 | 24.4 | 17.0 | 7.1 | 1.3 |
| DAILY MINIMUM | -16.3 | -15.1 | -8.4 | -1.3 | 4.4 | 9.3 | 12.9 | 11.2 | 5.1 | -.9 | -7.8 | -12.9 |
| EXTREME MAXIMUM | 16.7 | 22.2 | 27.2 | 34.4 | 38.9 | 43.9 | 44.4 | 43.3 | 41.7 | 33.9 | 24.4 | 21.7 |
| EXTREME MINIMUM | -46.1 | -50.0 | -37.2 | -25.0 | -12.2 | -1.7 | -.6 | .0 | -7.8 | -25.6 | -35.0 | -39.4 |
| HEATING DEGREE DAYS(18C) | 862 | 675 | 609 | 341 | 175 | 70 | 7 | 12 | 133 | 305 | 551 | 754 |

CLIMATOLOGICAL DATA FOR

JORDAN

LAT: 47.32 LONG: 106.90 ELEV: 2800(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 14.9 | 21.6 | 29.6 | 44.5 | 55.1 | 63.5 | 72.1 | 70.1 | 58.2 | 47.3 | 31.9 | 21.2 |
| DAILY MAXIMUM | 28.1 | 31.7 | 43.2 | 59.0 | 70.0 | 78.6 | 90.3 | 87.7 | 75.9 | 62.6 | 44.8 | 34.4 |
| DAILY MINIMUM | 2.7 | 4.8 | 16.8 | 29.6 | 40.0 | 48.8 | 55.3 | 52.1 | 41.1 | 30.3 | 17.9 | 8.7 |
| EXTREME MAXIMUM | 62.0 | 72.0 | 81.0 | 94.0 | 102.0 | 111.0 | 112.0 | 110.0 | 107.0 | 93.0 | 76.0 | 71.0 |
| EXTREME MINIMUM | -51.0 | -58.0 | -35.0 | -13.0 | 10.0 | 29.0 | 31.0 | 32.0 | 18.0 | -14.0 | -31.0 | -39.0 |
| HEATING DEGREE DAYS(65F) | 1553 | 1215 | 1097 | 615 | 316 | 127 | 14 | 22 | 240 | 549 | 993 | 1358 |

CLIMATOLOGICAL DATA FOR

KALISPELL

LAT: 48.22 LONG: 114.27 ELEV: 899(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -6.5 | -3.9 | .9 | 6.5 | 11.3 | 14.7 | 18.9 | 17.8 | 12.5 | 6.9 | .0 | -4.1 |
| DAILY MAXIMUM | -2.2 | 1.2 | 6.2 | 12.9 | 18.3 | 21.9 | 27.8 | 26.9 | 20.5 | 13.2 | 3.9 | -.4 |
| DAILY MINIMUM | -10.8 | -9.0 | -4.4 | .1 | 4.3 | 7.4 | 9.9 | 8.6 | 4.4 | .5 | -3.9 | -7.7 |
| EXTREME MAXIMUM | 8.3 | 11.7 | 16.1 | 22.8 | 30.6 | 33.9 | 40.0 | 40.6 | 32.2 | 26.1 | 17.8 | 8.9 |
| EXTREME MINIMUM | -30.6 | -30.0 | -33.9 | -6.1 | -2.2 | -.6 | 2.2 | 2.8 | -5.0 | -7.8 | -33.3 | -25.6 |
| HEATING DEGREE DAYS(18C) | 770 | 622 | 538 | 355 | 217 | 119 | 26 | 46 | 181 | 355 | 550 | 693 |

CLIMATOLOGICAL DATA FOR

KALISPELL

LAT: 48.22 LONG: 114.27 ELEV: 2959(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 20.3 | 25.0 | 33.7 | 43.7 | 52.4 | 58.4 | 66.0 | 64.0 | 54.5 | 44.4 | 32.0 | 24.7 |
| DAILY MAXIMUM | 28.0 | 34.1 | 43.2 | 55.2 | 65.0 | 71.4 | 82.1 | 80.5 | 68.9 | 55.8 | 39.1 | 31.2 |
| DAILY MINIMUM | 12.6 | 15.8 | 24.1 | 32.2 | 39.8 | 45.4 | 49.9 | 47.4 | 40.0 | 32.9 | 24.9 | 18.2 |
| EXTREME MAXIMUM | 47.0 | 53.0 | 61.0 | 73.0 | 87.0 | 93.0 | 104.0 | 105.0 | 90.0 | 79.0 | 64.0 | 48.0 |
| EXTREME MINIMUM | -23.0 | -22.0 | -29.0 | 21.0 | 28.0 | 31.0 | 36.0 | 37.0 | 23.0 | 18.0 | -28.0 | -14.0 |
| HEATING DEGREE DAYS(65F) | 1386 | 1120 | 970 | 639 | 391 | 215 | 47 | 83 | 326 | 639 | 990 | 1249 |

CLIMATOLOGICAL DATA FOR

LEWISTOWN

LAT: 47.07 LONG: 109.42 ELEV: 1203(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -6.9 | -5.3 | -1.9 | 4.9 | 10.3 | 14.1 | 18.9 | 18.0 | 12.7 | 7.8 | .1 | -3.6 |
| DAILY MAXIMUM | -.6 | 1.3 | 4.3 | 11.9 | 17.7 | 21.3 | 27.7 | 26.9 | 20.9 | 15.4 | 6.6 | 2.8 |
| DAILY MINIMUM | -13.2 | -11.9 | -8.1 | -2.2 | 2.9 | 6.8 | 10.1 | 9.1 | 4.5 | .2 | -6.4 | -9.9 |
| EXTREME MAXIMUM | 18.9 | 17.8 | 23.3 | 31.7 | 33.3 | 37.2 | 37.8 | 39.4 | 35.6 | 31.7 | 25.0 | 23.3 |
| EXTREME MINIMUM | -36.7 | -41.1 | -33.3 | -27.2 | -11.7 | -2.2 | .6 | .0 | -6.7 | -23.3 | -33.9 | -35.6 |
| HEATING DEGREE DAYS(18C) | 776 | 635 | 638 | 422 | 253 | 125 | 36 | 46 | 178 | 322 | 546 | 677 |

CLIMATOLOGICAL DATA FOR

LEWISTOWN

LAT: 47.07 LONG: 109.42 ELEV: 3960(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 19.6 | 22.5 | 28.6 | 40.8 | 50.5 | 57.3 | 66.1 | 64.4 | 54.9 | 46.1 | 32.2 | 25.6 |
| DAILY MAXIMUM | 31.0 | 34.4 | 39.8 | 53.5 | 63.8 | 70.4 | 81.9 | 80.4 | 69.6 | 59.8 | 43.8 | 37.0 |
| DAILY MINIMUM | 8.2 | 10.5 | 17.4 | 28.0 | 37.2 | 44.2 | 50.2 | 48.3 | 40.1 | 32.3 | 20.5 | 14.2 |
| EXTREME MAXIMUM | 66.0 | 64.0 | 74.0 | 89.0 | 92.0 | 99.0 | 100.0 | 103.0 | 96.0 | 89.0 | 77.0 | 74.0 |
| EXTREME MINIMUM | -34.0 | -42.0 | -28.0 | -17.0 | 11.0 | 28.0 | 33.0 | 32.0 | 20.0 | -10.0 | -29.0 | -32.0 |
| HEATING DEGREE DAYS(65F) | 1397 | 1143 | 1149 | 760 | 456 | 225 | 66 | 84 | 322 | 581 | 984 | 1219 |

CLIMATOLOGICAL DATA FOR

LIBBY

LAT: 48.40 LONG: 115.58 ELEV: 624(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -5.6 | -2.2 | 2.4 | 7.7 | 12.4 | 15.8 | 19.7 | 18.5 | 13.9 | 7.9 | .3 | -2.9 |
| DAILY MAXIMUM | -.7 | 3.8 | 9.7 | 16.8 | 22.3 | 25.7 | 32.1 | 30.8 | 24.5 | 15.2 | 4.6 | .7 |
| DAILY MINIMUM | -10.5 | -8.3 | -4.9 | -1.4 | 2.6 | 5.8 | 7.3 | 6.1 | 3.3 | .7 | -4.1 | -6.5 |
| EXTREME MAXIMUM | 13.3 | 17.2 | 23.9 | 31.7 | 38.9 | 38.9 | 42.2 | 42.8 | 38.9 | 31.7 | 19.4 | 13.9 |
| EXTREME MINIMUM | -38.9 | -38.3 | -28.9 | -20.6 | -11.1 | -4.4 | -1.1 | -2.2 | -8.9 | -21.7 | -32.2 | -31.1 |
| HEATING DEGREE DAYS(18C) | 716 | 550 | 510 | 331 | 189 | 88 | 26 | 35 | 140 | 340 | 547 | 655 |

CLIMATOLOGICAL DATA FOR

LIBBY

LAT: 48.40 LONG: 115.58 ELEV: 2053(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 22.0 | 28.0 | 36.4 | 45.8 | 54.4 | 60.4 | 67.5 | 65.3 | 57.0 | 46.3 | 32.5 | 26.8 |
| DAILY MAXIMUM | 30.8 | 38.9 | 49.5 | 62.2 | 72.1 | 78.2 | 89.7 | 87.5 | 76.1 | 59.4 | 40.2 | 33.3 |
| DAILY MINIMUM | 13.1 | 17.1 | 23.2 | 29.4 | 36.7 | 42.5 | 45.2 | 43.0 | 37.9 | 33.2 | 24.7 | 20.3 |
| EXTREME MAXIMUM | 56.0 | 63.0 | 75.0 | 89.0 | 102.0 | 102.0 | 108.0 | 109.0 | 102.0 | 89.0 | 67.0 | 57.0 |
| EXTREME MINIMUM | -38.0 | -37.0 | -20.0 | -5.0 | 12.0 | 24.0 | 30.0 | 28.0 | 16.0 | -7.0 | -26.0 | -24.0 |
| HEATING DEGREE DAYS(65F) | 1290 | 991 | 919 | 596 | 341 | 159 | 48 | 64 | 252 | 613 | 985 | 1179 |

CLIMATOLOGICAL DATA FOR

LIVINGSTON

LAT: 45.65 LONG: 110.57 ELEV: 1364(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -4.1 | -1.9 | .8 | 6.4 | 11.3 | 15.1 | 20.1 | 19.1 | 14.1 | 9.2 | 1.9 | -1.1 |
| DAILY MAXIMUM | 1.3 | 3.8 | 6.9 | 13.6 | 18.9 | 22.8 | 29.4 | 28.6 | 22.5 | 16.4 | 7.3 | 4.0 |
| DAILY MINIMUM | -9.4 | -7.7 | -5.4 | -.7 | 3.7 | 7.4 | 10.7 | 9.7 | 5.7 | 1.9 | -3.6 | -6.0 |
| EXTREME MAXIMUM | 15.0 | 19.4 | 22.2 | 30.6 | 33.9 | 40.6 | 38.9 | 38.3 | 36.7 | 29.4 | 22.8 | 20.0 |
| EXTREME MINIMUM | -36.7 | -42.8 | -29.4 | -23.3 | -11.1 | -2.2 | 1.7 | .0 | -6.7 | -22.2 | -32.8 | -32.2 |
| HEATING DEGREE DAYS(18C) | 668 | 537 | 541 | 361 | 211 | 91 | 20 | 30 | 134 | 271 | 484 | 584 |

CLIMATOLOGICAL DATA FOR

LIVINGSTON

LAT: 45.65 LONG: 110.57 ELEV: 4490(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 24.7 | 28.5 | 33.4 | 43.6 | 52.4 | 59.2 | 68.2 | 66.4 | 57.4 | 48.6 | 35.4 | 30.1 |
| DAILY MAXIMUM | 34.3 | 38.8 | 44.5 | 56.4 | 66.0 | 73.0 | 85.0 | 83.4 | 72.5 | 61.6 | 45.2 | 39.2 |
| DAILY MINIMUM | 15.1 | 18.2 | 22.2 | 30.7 | 38.7 | 45.4 | 51.3 | 49.4 | 42.2 | 35.5 | 25.5 | 21.2 |
| EXTREME MAXIMUM | 59.0 | 67.0 | 72.0 | 87.0 | 93.0 | 105.0 | 102.0 | 101.0 | 98.0 | 85.0 | 73.0 | 68.0 |
| EXTREME MINIMUM | -34.0 | -45.0 | -21.0 | -10.0 | 12.0 | 28.0 | 35.0 | 32.0 | 20.0 | -8.0 | -27.0 | -26.0 |
| HEATING DEGREE DAYS(65F) | 1204 | 968 | 974 | 650 | 380 | 165 | 36 | 55 | 242 | 488 | 872 | 1052 |

CLIMATOLOGICAL DATA FOR

MILESCITY

LAT: 46.42 LONG: 105.82 ELEV: 718(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -8.6 | -6.5 | -.6 | 7.6 | 14.1 | 18.7 | 24.1 | 22.6 | 16.1 | 9.4 | .3 | -4.9 |
| DAILY MAXIMUM | -2.6 | -.1 | 5.7 | 14.8 | 21.4 | 25.8 | 32.3 | 30.8 | 24.0 | 16.9 | 6.4 | .9 |
| DAILY MINIMUM | -14.7 | -12.9 | -7.0 | .4 | 6.7 | 11.4 | 15.8 | 14.3 | 8.2 | 1.9 | -5.7 | -10.7 |
| EXTREME MAXIMUM | 16.7 | 18.9 | 28.3 | 32.8 | 37.2 | 40.0 | 42.8 | 43.3 | 40.6 | 33.9 | 23.9 | 20.6 |
| EXTREME MINIMUM | -38.3 | -38.3 | -32.8 | -13.9 | -9.4 | .0 | 5.0 | 1.7 | -6.7 | -12.8 | -30.6 | -35.0 |
| HEATING DEGREE DAYS(18C) | 835 | 695 | 587 | 321 | 153 | 55 | 3 | 3 | 96 | 278 | 540 | 720 |

CLIMATOLOGICAL DATA FOR

MILESCITY

LAT: 46.42 LONG: 105.82 ELEV: 2364(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 16.5 | 20.3 | 30.9 | 45.7 | 57.4 | 65.6 | 75.3 | 72.6 | 61.0 | 49.0 | 32.6 | 23.2 |
| DAILY MAXIMUM | 27.4 | 31.8 | 42.3 | 58.6 | 70.6 | 78.5 | 90.2 | 87.5 | 75.2 | 62.4 | 43.5 | 33.6 |
| DAILY MINIMUM | 5.6 | 8.7 | 19.4 | 32.8 | 44.1 | 52.6 | 60.4 | 57.7 | 46.7 | 35.5 | 21.7 | 12.8 |
| EXTREME MAXIMUM | 62.0 | 66.0 | 83.0 | 91.0 | 99.0 | 104.0 | 109.0 | 110.0 | 105.0 | 93.0 | 75.0 | 69.0 |
| EXTREME MINIMUM | -37.0 | -37.0 | -27.0 | 7.0 | 15.0 | 32.0 | 41.0 | 35.0 | 20.0 | 9.0 | -23.0 | -31.0 |
| HEATING DEGREE DAYS(65F) | 1504 | 1252 | 1057 | 579 | 276 | 99 | 6 | 6 | 174 | 502 | 972 | 1296 |

CLIMATOLOGICAL DATA FOR

MISSOULA

LAT: 46.87 LONG: 114.00 ELEV: 979(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -7.0 | -3.5 | 1.5 | 7.1 | 12.0 | 15.7 | 20.2 | 18.9 | 13.2 | 7.2 | -.1 | -4.7 |
| DAILY MAXIMUM | -1.9 | 2.1 | 7.6 | 14.4 | 19.9 | 23.8 | 30.2 | 28.8 | 21.9 | 14.4 | 4.9 | -.2 |
| DAILY MINIMUM | -12.2 | -9.1 | -4.6 | -.3 | 4.1 | 7.5 | 10.2 | 9.1 | 4.5 | -.2 | -5.1 | -9.2 |
| EXTREME MAXIMUM | 8.9 | 13.3 | 21.1 | 25.6 | 30.0 | 35.6 | 40.6 | 40.6 | 30.0 | 26.1 | 14.4 | 7.8 |
| EXTREME MINIMUM | -25.6 | -7.8 | -22.2 | -6.7 | -5.6 | -.6 | 2.2 | .0 | -4.4 | -8.3 | -16.7 | -26.1 |
| HEATING DEGREE DAYS(18C) | 785 | 611 | 521 | 338 | 202 | 97 | 12 | 31 | 162 | 346 | 551 | 712 |

CLIMATOLOGICAL DATA FOR

MISSOULA

LAT: 46.87 LONG: 114.00 ELEV: 3223(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 19.4 | 25.7 | 34.7 | 44.7 | 53.6 | 60.2 | 68.4 | 66.1 | 55.8 | 44.9 | 31.9 | 23.6 |
| DAILY MAXIMUM | 28.6 | 35.7 | 45.6 | 57.9 | 67.8 | 74.8 | 86.3 | 83.8 | 71.4 | 58.0 | 40.9 | 31.6 |
| DAILY MINIMUM | 10.1 | 15.6 | 23.7 | 31.4 | 39.4 | 45.5 | 50.4 | 48.3 | 40.1 | 31.7 | 22.9 | 15.5 |
| EXTREME MAXIMUM | 48.0 | 56.0 | 70.0 | 78.0 | 86.0 | 96.0 | 105.0 | 105.0 | 86.0 | 79.0 | 58.0 | 46.0 |
| EXTREME MINIMUM | -14.0 | 18.0 | -8.0 | 20.0 | 22.0 | 31.0 | 36.0 | 32.0 | 24.0 | 17.0 | 2.0 | -15.0 |
| HEATING DEGREE DAYS(65F) | 1414 | 1100 | 939 | 609 | 365 | 176 | 22 | 57 | 292 | 623 | 993 | 1283 |

CLIMATOLOGICAL DATA FOR

PLENTYWOOD

LAT: 48.78 LONG: 104.57 ELEV: 615(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -13.4 | -10.2 | -4.3 | 5.6 | 12.3 | 16.9 | 20.8 | 20.1 | 13.7 | 7.7 | -2.2 | -9.4 |
| DAILY MAXIMUM | -7.3 | -4.7 | 1.9 | 13.0 | 20.1 | 24.3 | 28.8 | 28.4 | 21.8 | 14.2 | 3.4 | -3.2 |
| DAILY MINIMUM | -20.4 | -18.1 | -10.9 | -1.9 | 4.3 | 9.4 | 11.8 | 10.4 | 4.9 | -1.3 | -9.3 | -15.4 |
| EXTREME MAXIMUM | 12.2 | 20.0 | 25.0 | 33.3 | 39.4 | 40.0 | 47.2 | 41.7 | 38.3 | 31.7 | 23.3 | 20.0 |
| EXTREME MINIMUM | -46.1 | -50.0 | -38.9 | -21.1 | -11.7 | -5.6 | -1.1 | -1.1 | -12.8 | -21.7 | -35.0 | -41.1 |
| HEATING DEGREE DAYS(18C) | 983 | 799 | 702 | 381 | 191 | 75 | 11 | 20 | 152 | 330 | 616 | 859 |

CLIMATOLOGICAL DATA FOR

PLENTYWOOD

LAT: 48.78 LONG: 104.57 ELEV: 2024(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 7.9 | 13.6 | 24.2 | 42.1 | 54.1 | 62.5 | 69.5 | 68.1 | 56.7 | 45.8 | 28.0 | 15.1 |
| DAILY MAXIMUM | 18.9 | 23.6 | 35.4 | 55.4 | 68.2 | 75.7 | 83.9 | 83.2 | 71.2 | 57.6 | 38.1 | 26.3 |
| DAILY MINIMUM | -4.7 | -.6 | 12.3 | 28.5 | 39.7 | 48.9 | 53.3 | 50.8 | 40.9 | 29.7 | 15.2 | 4.3 |
| EXTREME MAXIMUM | 54.0 | 68.0 | 77.0 | 92.0 | 103.0 | 104.0 | 117.0 | 107.0 | 101.0 | 89.0 | 74.0 | 68.0 |
| EXTREME MINIMUM | -51.0 | -58.0 | -38.0 | -6.0 | 11.0 | 22.0 | 30.0 | 30.0 | 9.0 | -7.0 | -31.0 | -42.0 |
| HEATING DEGREE DAYS(65F) | 1770 | 1439 | 1265 | 687 | 344 | 135 | 21 | 37 | 275 | 595 | 1110 | 1547 |

CLIMATOLOGICAL DATA FOR

POLSON

LAT: 47.68 LONG: 114.17 ELEV: 896(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -3.9 | -2.3 | 1.7 | 7.1 | 11.7 | 15.4 | 19.7 | 18.7 | 13.8 | 7.9 | 1.4 | -1.3 |
| DAILY MAXIMUM | -.6 | 1.8 | 6.7 | 13.2 | 18.4 | 22.3 | 27.9 | 26.8 | 20.7 | 13.3 | 5.3 | 1.9 |
| DAILY MINIMUM | -7.4 | -6.4 | -3.2 | 1.1 | 4.9 | 8.6 | 11.3 | 10.6 | 6.8 | 2.6 | -2.5 | -4.4 |
| EXTREME MAXIMUM | 14.4 | 18.3 | 22.2 | 25.0 | 31.7 | 33.9 | 40.0 | 38.3 | 32.8 | 27.8 | 18.3 | 16.7 |
| EXTREME MINIMUM | -34.4 | -32.8 | -23.3 | -18.3 | -8.3 | -1.1 | 2.8 | .6 | -3.9 | -17.2 | -29.4 | -25.6 |
| HEATING DEGREE DAYS(18C) | 667 | 553 | 530 | 346 | 216 | 100 | 31 | 31 | 146 | 338 | 518 | 608 |

CLIMATOLOGICAL DATA FOR

POLSON

LAT: 47.68 LONG: 114.17 ELEV: 2949(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 24.9 | 27.9 | 35.1 | 44.8 | 53.0 | 59.8 | 67.4 | 65.7 | 56.8 | 46.3 | 34.5 | 29.7 |
| DAILY MAXIMUM | 31.0 | 35.3 | 44.0 | 55.7 | 65.1 | 72.1 | 82.3 | 80.3 | 69.3 | 55.9 | 41.5 | 35.4 |
| DAILY MINIMUM | 18.7 | 20.4 | 26.2 | 33.9 | 40.8 | 47.4 | 52.4 | 51.1 | 44.2 | 36.6 | 27.5 | 24.0 |
| EXTREME MAXIMUM | 58.0 | 65.0 | 72.0 | 77.0 | 89.0 | 93.0 | 104.0 | 101.0 | 91.0 | 82.0 | 65.0 | 62.0 |
| EXTREME MINIMUM | -30.0 | -27.0 | -10.0 | -1.0 | 17.0 | 30.0 | 37.0 | 33.0 | 25.0 | 1.0 | -21.0 | -14.0 |
| HEATING DEGREE DAYS(65F) | 1201 | 996 | 954 | 623 | 389 | 180 | 57 | 57 | 264 | 609 | 934 | 1096 |

CLIMATOLOGICAL DATA FOR

RED LODGE

LAT: 45.18 LONG: 109.25 ELEV: 1686(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -5.3 | -3.6 | -1.9 | 4.2 | 9.3 | 13.2 | 17.9 | 17.2 | 11.8 | 7.3 | .2 | -3.1 |
| DAILY MAXIMUM | .7 | 2.5 | 4.4 | 10.7 | 16.0 | 19.9 | 25.9 | 25.2 | 19.0 | 13.9 | 6.1 | 2.4 |
| DAILY MINIMUM | -11.4 | -9.7 | -8.3 | -2.3 | 2.7 | 6.3 | 9.9 | 9.3 | 4.6 | .6 | -5.6 | -8.7 |
| EXTREME MAXIMUM | 21.1 | 17.2 | 21.1 | 25.6 | 29.4 | 33.3 | 36.7 | 35.0 | 32.2 | 28.3 | 22.8 | 17.2 |
| EXTREME MINIMUM | -37.8 | -31.7 | -34.4 | -23.3 | -13.9 | -3.9 | -1.1 | -2.2 | -12.8 | -13.9 | -31.7 | -35.0 |
| HEATING DEGREE DAYS(18C) | 717 | 594 | 610 | 429 | 262 | 142 | 38 | 54 | 185 | 329 | 534 | 652 |

CLIMATOLOGICAL DATA FOR

RED LODGE

LAT: 45.18 LONG: 109.25 ELEV: 5548(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 22.4 | 25.5 | 28.6 | 39.6 | 48.8 | 55.7 | 64.3 | 63.0 | 53.3 | 45.1 | 32.4 | 26.4 |
| DAILY MAXIMUM | 33.2 | 36.5 | 40.0 | 51.2 | 60.8 | 67.9 | 78.6 | 77.3 | 66.2 | 57.1 | 42.9 | 36.4 |
| DAILY MINIMUM | 11.5 | 14.5 | 17.1 | 27.9 | 36.8 | 43.4 | 49.9 | 48.7 | 40.3 | 33.1 | 21.9 | 16.3 |
| EXTREME MAXIMUM | 70.0 | 63.0 | 70.0 | 78.0 | 85.0 | 92.0 | 98.0 | 95.0 | 90.0 | 83.0 | 73.0 | 63.0 |
| EXTREME MINIMUM | -36.0 | -25.0 | -30.0 | -10.0 | 7.0 | 25.0 | 30.0 | 28.0 | 9.0 | 7.0 | -25.0 | -31.0 |
| HEATING DEGREE DAYS(65F) | 1291 | 1070 | 1098 | 773 | 473 | 256 | 70 | 98 | 333 | 593 | 962 | 1174 |

CLIMATOLOGICAL DATA FOR

SIDNEY

LAT: 47.70 LONG: 104.17 ELEV: 586(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -11.1 | -7.7 | -2.3 | 6.7 | 12.9 | 17.5 | 21.6 | 20.7 | 14.3 | 8.4 | -.8 | -7.1 |
| DAILY MAXIMUM | | | | | | | | | | | | |
| DAILY MINIMUM | | | | | | | | | | | | |
| EXTREME MAXIMUM | DATA NOT AVAILABLE | | | | | | | | | | | |
| EXTREME MINIMUM | | | | | | | | | | | | |
| HEATING DEGREE DAYS(18C) | 911 | 727 | 638 | 350 | 175 | 65 | 9 | 18 | 140 | 306 | 575 | 788 |

CLIMATOLOGICAL DATA FOR

SIDNEY

LAT: 47.70 LONG: 104.17 ELEV: 1928(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 12.1 | 18.2 | 27.9 | 44.0 | 55.2 | 63.5 | 70.8 | 69.2 | 57.7 | 47.2 | 30.5 | 19.2 |
| DAILY MAXIMUM | | | | | | | | | | | | |
| DAILY MINIMUM | | | | | | | | | | | | |
| EXTREME MAXIMUM | DATA NOT AVAILABLE | | | | | | | | | | | |
| EXTREME MINIMUM | | | | | | | | | | | | |
| HEATING DEGREE DAYS(65F) | 1640 | 1310 | 1150 | 630 | 315 | 118 | 17 | 33 | 253 | 552 | 1035 | 1420 |

CLIMATOLOGICAL DATA FOR

THOMPSON FALLS

LAT: 47.58 LONG: 115.33 ELEV: 748(M)

TEMPERATURE AVERAGES BY MONTH *** DEGREES CELSIUS ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | -3.1 | .6 | 3.3 | 8.3 | 12.8 | 16.2 | 20.3 | 19.6 | 15.1 | 8.9 | 2.4 | -1.1 |
| DAILY MAXIMUM | 1.2 | 5.7 | 9.9 | 16.3 | 21.5 | 24.8 | 31.0 | 30.2 | 24.6 | 16.2 | 6.8 | 2.4 |
| DAILY MINIMUM | -7.3 | -4.7 | -3.3 | .3 | 4.1 | 7.6 | 9.6 | 8.9 | 5.6 | 1.7 | -2.1 | -4.6 |
| EXTREME MAXIMUM | 13.3 | 17.8 | 25.6 | 32.2 | 36.1 | 37.8 | 42.8 | 41.7 | 41.1 | 31.7 | 18.3 | 14.4 |
| EXTREME MINIMUM | -37.8 | -34.4 | -23.3 | -8.3 | -6.7 | -1.1 | 1.7 | .0 | -4.4 | -7.8 | -25.0 | -31.7 |
| HEATING DEGREE DAYS(18C) | 646 | 495 | 470 | 308 | 172 | 74 | 17 | 25 | 109 | 288 | 480 | 601 |

CLIMATOLOGICAL DATA FOR

THOMPSON FALLS

LAT: 47.58 LONG: 115.33 ELEV: 2463(FT)

TEMPERATURE AVERAGES BY MONTH *** DEGREES FAHRENHEIT ***

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAILY AVERAGE | 26.5 | 33.0 | 38.0 | 46.9 | 55.0 | 61.2 | 68.5 | 67.2 | 59.2 | 48.1 | 36.3 | 30.1 |
| DAILY MAXIMUM | 34.1 | 42.3 | 49.9 | 61.3 | 70.7 | 76.6 | 87.8 | 86.3 | 76.2 | 61.2 | 44.3 | 36.4 |
| DAILY MINIMUM | 18.8 | 23.6 | 26.0 | 32.5 | 39.3 | 45.7 | 49.2 | 48.1 | 42.1 | 35.0 | 28.3 | 23.7 |
| EXTREME MAXIMUM | 56.0 | 64.0 | 78.0 | 90.0 | 97.0 | 100.0 | 109.0 | 107.0 | 106.0 | 89.0 | 65.0 | 58.0 |
| EXTREME MINIMUM | -36.0 | -30.0 | -10.0 | 17.0 | 20.0 | 30.0 | 35.0 | 32.0 | 24.0 | 18.0 | -13.0 | -25.0 |
| HEATING DEGREE DAYS(65F) | 1164 | 891 | 847 | 556 | 311 | 134 | 32 | 46 | 197 | 519 | 864 | 1083 |

CLIMATOLOGICAL DATA FOR

WEST YELLOWSTONE

LAT: 44.92 LONG: 111.07 ELEV: 2026(M)

| TEMPERATURE AVERAGES BY MONTH | | | | | | *** DEGREES CELSIUS *** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| DAILY AVERAGE | | | | | | | | | | | |
| -10.6 | -8.4 | -5.3 | 1.1 | 6.7 | 10.8 | 15.3 | 14.1 | 8.9 | 3.2 | -5.2 | -9.9 |
| DAILY MAXIMUM | | | | | | | | | | | |
| -4.3 | -.4 | 3.4 | 8.9 | 15.2 | 19.8 | 26.6 | 25.2 | 19.1 | 11.8 | 1.6 | -3.3 |
| DAILY MINIMUM | | | | | | | | | | | |
| -16.9 | -16.5 | -14.1 | -6.8 | -1.8 | 1.8 | 4.1 | 2.9 | -1.2 | -5.4 | -11.9 | -16.6 |
| EXTREME MAXIMUM | | | | | | | | | | | |
| 7.8 | 13.3 | 16.1 | 22.2 | 28.3 | 32.8 | 35.0 | 35.6 | 32.8 | 26.1 | 17.8 | 12.2 |
| EXTREME MINIMUM | | | | | | | | | | | |
| -51.1 | -46.7 | -41.7 | -27.2 | -17.8 | -7.2 | -6.7 | -7.8 | -11.7 | -20.0 | -37.8 | -46.7 |
| HEATING DEGREE DAYS(18C) | | | | | | | | | | | |
| 910 | 756 | 744 | 526 | 353 | 217 | 83 | 127 | 272 | 464 | 702 | 884 |

CLIMATOLOGICAL DATA FOR

WEST YELLOWSTONE

LAT: 44.92 LONG: 111.07 ELEV: 6665(FT)

| TEMPERATURE AVERAGES BY MONTH | | | | | | *** DEGREES FAHRENHEIT *** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| DAILY AVERAGE | | | | | | | | | | | |
| 12.9 | 16.8 | 22.4 | 33.9 | 44.1 | 51.5 | 59.6 | 57.3 | 48.1 | 37.8 | 22.7 | 14.1 |
| DAILY MAXIMUM | | | | | | | | | | | |
| 24.2 | 31.2 | 38.1 | 48.0 | 59.3 | 67.7 | 79.9 | 77.3 | 66.3 | 53.3 | 34.9 | 26.1 |
| DAILY MINIMUM | | | | | | | | | | | |
| 1.5 | 2.3 | 6.6 | 19.8 | 28.8 | 35.2 | 39.3 | 37.2 | 29.8 | 22.2 | 10.5 | 2.1 |
| EXTREME MAXIMUM | | | | | | | | | | | |
| 46.0 | 56.0 | 61.0 | 72.0 | 83.0 | 91.0 | 95.0 | 96.0 | 91.0 | 79.0 | 64.0 | 54.0 |
| EXTREME MINIMUM | | | | | | | | | | | |
| -60.0 | -52.0 | -43.0 | -17.0 | .0 | 19.0 | 20.0 | 18.0 | 11.0 | -4.0 | -36.0 | -52.0 |
| HEATING DEGREE DAYS(65F) | | | | | | | | | | | |
| 1638 | 1361 | 1340 | 947 | 636 | 392 | 151 | 230 | 491 | 836 | 1265 | 1592 |

# APPENDIX I: REVIEW OF SOLAR DESIGN PROCEDURES

## Introduction

An exhaustive critical review of the literature describing solar system design and economic analysis procedures is beyond the scope of this Data Manual. This review is presented to familiarize the user of this Manual with some of the better known procedures. Details of design procedures are described in many of the references listed in this Manual. These references are generally available from (a) local library resources such as Montana On-Line Reference Service; (b) government agencies (DOE, HUD, NBS, Government Printing Office; and (c) directly from the author of the reference.

Detailed simulation methods using large computers have been developed and used for research purposes and for the design of large and complex solar installations. These programs usually require hourly solar and weather data along with a detailed description of the solar system components and control system. The use of these precise methods is usually not economically justified for the design of small systems for a home or small commercial building.

Several simplified methods have been developed which use monthly average solar and weather data (such as the data given in this Manual). These methods have been developed under various government sponsored research projects and are available to the general public. Some well known methods are briefly discussed in this Manual to give the reader a general idea of the input requirements and the output produced by each method.

The inclusion of these design methods in this Manual does not constitute an endorsement of these procedures. The methods were selected for review because they are widely used and are generally available. The individual solar designer must select a design method appropriate to the requirements of his project.

## Acknowledgement

Much of the material in this design section was taken from The California Data Manual. This manual is available from the California Energy

Commission, 1111 Howe Avenue, Sacramento, CA and contains much useful information. Thanks are due to the authors of the manual and to Dan Kazama for authorizing us to draw upon this work.

Cal-ERDA

This program is being developed by collaboration between Lawrence Berkeley Laboratory, Consultants Computation Bureau, Argonne National Laboratory, Los Alamos Scientific Laboratory, National Bureau of Standards, and Construction Engineering Research Laboratory, with support from the State of California and ERDA (hence the name). The program features a special language that facilitates the user's description of the building. Performance and cost evaluations can be made. The principal motivation for Cal-ERDA was energy conservation in buildings, but active solar systems (roof-mounted collectors) can be treated. The best source of information is the user's manual (Cal-ERDA Group, 1977).

University of Wisconsin F-chart Method

This method is based on a performance chart (the f-chart) that allows the user to determine the fraction, f, of the heating load provided by solar energy for a given collector area. The f-chart is applied after the user has specified the space heating and domestic hot-water load, certain parameters of the collecting system (for example, collector efficiency), the monthly total solar radiation, and the monthly mean temperature and heating degree days.

The f-chart method was developed from detailed considerations of solar heating systems for buildings by Klein, Beckman and Duffie (1976). The actual parameters of the chart were generated empirically from some 300 detailed simulations based on TRNSYS. There are at least four different approaches to the use of f-chart:

a. Original Papers

The basic method and its application to liquid systems is described by Klein, Beckman and Duffie (1976). An extension of the method to air systems is also given by the same authors (1977). The first paper includes a prescription for calculating the dollars saved annually by using a solar system

rather than a conventional system. The prescription also explains how to determine the collector area that maximizes the savings. The application of f-chart using these papers is not completely straightforward, and requires a good knowledge of solar energy fundamentals and a good grasp of mathematics. Most users will find the other approaches more convenient.

b. FCHART: The University of Wisconsin Interactive Solar Heating Design Program

FCHART is an interactive computer program version of the method as it is presented in the original papers. The program is accompanied by some descriptive material, but a knowledge of solar energy fundamentals is still helpful. The program handles all the calculations and provides pre-set (default) values for all the various input parameters. The user need only change those parameters that are different for the user's system. Solar and weather data are built into the program for 100 locations across the United States. The use of data contained in this Data Manual for specific Montana sites should improve the accuracy of this method. At the option of the user, FCHART will perform a life cycle cost analysis and determine the collector area that minimizes the costs.

c. Solar Heating of Buildings and Domestic Hot Water

This report contains an approach to f-chart developed by Beck and Field (1976) for the Naval Facilities Engineering Command. Methods are provided to estimate the yearly value of fuel saved, the "present worth" of 15 years of fuel savings, and the cost of solar energy systems. Worksheets and step-by-step instructions are given to guide the user in preparing the input to performance and cost analysis. The report presents descriptive and numerical information concerning many aspects of solar energy systems, including types of flat-plate collectors, collector heat losses, selective surfaces, storage methods, maintenance, temperature rise through collectors, and architectural considerations. Two complete examples are also given: one for a residence and the other for a dental dispensary. Though the report contains tables of solar radiation for 52 locations, using the solar and weather data in this Manual is recommended.

d. HUD Intermediate Minimum Property Standards for Solar Heating and Domestic Hot-Water Systems

This document, prepared by the National Bureau of Standards for HUD (NBS/HUD, 1976), gives a step-by-step approach to using f-chart. The space-heating step requires reference to another HUD report, but otherwise, the approach is largely self-contained. Though there is no cost analysis, the document contains a wealth of descriptive and numerical information. Topics include safety considerations, corrosion, material lifetimes, seismic and hail load, condensation in collectors, absorptive coatings, storage methods, ducts and pipes, heat transfer fluids, and sealing compounds. In addition, a complete example for a residence is given.

Solar data and mean temperatures (but not degree-days) are presented for 80 locations (2 in Montana). The use of the solar and weather data in this Manual is recommended.

Los Alamos Scientific Laboratory (LASL) Method

The basic idea of this method is similar to that of f-chart. An "x-factor" is defined that relates the fraction of the heating load supplied by solar energy to the collector area (Balcomb and Hedstrom, 1976). The parameters of the x-factor were determined empirically by a detailed computer simulation analysis of 25 U.S. and Canadian cities. The factor applies to air or liquid heating systems using flat-plate collectors.

In contrast to the f-chart, the x-factor has the parameters of a "standard" solar energy system built in. As a consequence, the LASL method is generally easier to apply than f-chart. On the other hand, the LASL method (with some exceptions, see below) cannot be used to examine the performance as a function of collector efficiency, tilt angle, and storage capacity per unit collector area. Another difference is that the LASL method only calculates the fraction of the annual load supplied by solar energy.

To use this method, it is necessary to specify the building's heating load in Btu's per degree-day, the monthly total radiation, and the monthly total degree-days. A step-by-step explanation of this method is described by Balcomb and Hedstrom (1976). The paper presents a quantity called "LC", which has been calculated from solar and weather data, along with the x-factor.

Once the user has specified the heating load in Btu's per degree-day, the tabulated values of LC can be used to calculate in a very simple way the required collector area for 25%, 50%, and 75% of the annual load to be supplied by solar. The knowledgeable solar-energy user should not have any difficulty using either LC or the x-factor as presented in the paper. A cost analysis is not included.

Martin Marietta Method (SOLCOST)

SOLCOST is a computer program developed by Martin Marietta (Denver) for ERDA. Connolly et al. (1976) have given a technical description of the method, but its application requires the computer program and the user's manual (Martin Marietta, 1977). SOLCOST has received some, but not extensive, verification.

SOLCOST differs from f-chart and the LASL method in that it performs a detailed simulation for an "average day" for each month. According to Connolly et al. (1976), "this approach provides an accurate solution while keeping computer costs to a reasonable value". SOLCOST is more versatile than the other methods. It is designed to handle hot-water systems, absorption cycle air conditioners, solar-assisted heat pumps, and some passive features, as well as air and liquid space-heating systems. A variety of methods can be used to specify the load, ranging from monthly fuel bills to transient simulations. Collectors may be evacuated tubes, or one- or two-axis concentrators, in addition to flat plates.

The weather data required are minimum and maximum temperatures, heating degree days and (for cooling only) minimum and maximum relative humidity. The solar data are percent possible sunshine (PP) and "clearness number". The program uses a recipe to compute the solar radiation. The weather and solar data are built into the program for 124 cities (2 in Montana). Data in this Montana Solar Data Manual can be used to improve these estimates.

The program will perform a life-cycle cost analysis relative to a reference system. At the user's option, the program will compute the collector area that minimizes this cost.

Users with a good knowledge of solar energy fundamentals should not have any particular difficulty applying SOLCOST. The user's manual provides

standard forms to help structure the input to the program. The forms must then be converted to punched cards by someone familiar with computer input formats. Most of the input parameters have pre-set (default) values and only those that are different for the user's applications need be changed.

The solar designer can send his system description to commercial sources who have implemented SOLCOST on their computer. For a fee of less than $50 they will run his system and send the SOLCOST output to him.

Other design resources

Design routines which can be implemented on low cost hand calculators have been developed. Some programs are available in the literature and may be copied. Software for passive and active solar design using programmable hand calculators are available from several commerical sources. (Look for advertisements in monthly periodicals such as Solar Engineering, Solar Age, Solar Heating & Cooling, or various "Guides" to solar equipment.)

Manufacturers of solar equipment usually provide some type of design support to help the user select properly sized components. Lists of manufacturers are available through government sources, trade journals and solar energy books available at many local bookstores.

The design services of local engineers, architects and heating contractors may be used. Names and addresses can be obtained through the appropriate professional organizations, trade organizations or the Yellow Pages of the phone book.

Conclusion

The solar data in this Manual should be utilized in any of the preceding design procedures. At this time our solar data covers only one to two years and should not be considered "typical". If you enlist the design services of consultants and manufacturers (especially those outside Montana) you should make them aware of the information in the Montana Solar Data Manual.

There has been a rapid growth in all areas of solar utilization in the past few years. In the late 1960's there were only about a dozen solar heated buildings in the United States; now there are thousands of solar homes

completed or under construction. In Montana there is probably at least one solar home within 50 miles of your home. A number of these homes are "demonstration projects" funded by the Alternative Renewable Energy Sources Program of the Montana DNR&C and are available to the public for viewing. A person who is considering investing in a solar system should visit these homes.

The novice solar designer has an increasing resource base against which he can measure and improve his ideas. The novice designer would do well to keep in mind the adage "Those who neglect to study history are fated to repeat it".

Summaries of FCHART, LASL and SOLCOST requirements are shown on the following pages.

# UNIVERSITY OF WISCONSIN METHOD (F-CHART)

| | | |
|---|---|---|
| Computation level: | Hand calculator with trig functions. | (a) |
| | Interactive computer program. | (b) |
| | Hand calculator. | (c,d) |
| Units: | Metric (a); Engineering (c,d); Either system (b). | |
| Solar system types: | Liquid flat plate collector, heat exchanger to storage tank, w/wo domestic hot water. | (a,b,c,d) |
| or: | Air flat plate collector, pebble bed storage, w/wo domestic hot water. | (a,b,c,d) |
| Solar data needed: | Monthly total radiation on tilted surface. | (a,c,d) |
| or: | Monthly total radiation on horizontal surface and tilt calculation. | (a,b,c,d) |
| Tilt calculation: | Equation for any tilt angle, south orientation. | (a) |
| | Built-in for any tilt angle, south orientation. | (b) |
| | Graph for latitude $+10^{o}$, south orientation. | (c) |
| | Tables for latitude, latitude $\pm 15^{o}$, vertical, south orientation. | (d) |
| Weather data needed: | Monthly average ambient temperature and degree days. | (a,b,c,d) |
| System parameters: | Slope and intercept of collector efficiency curve. | (a,b,c,d) |
| | Effectiveness of collector-tank heat exchanger. | (a,b,c,d)* |
| | Various heat capacity flow rates. | (a,b,c,d)* |
| | Storage tank volume per unit collector area. | (a,b,c,d) |
| Space heating input: | Building load in energy units per month. | (a,b,c,d) |
| or: | Constant characterizing the load in units of energy per degree-day. | (a,b,c,d) |
| Hot water input: | Domestic hot water load in energy units. | (a,b,c,d) |
| or: | Constants characterizing the demand, water main temperature, minimum acceptable temperature. | (a,b,c,d) |
| Cost analysis: | "Annual Dollar Savings" based on $\$/m^2$ of collector (installed), fixed costs, \$/unit capacity storage, annual charge on capital investment, auxiliary fuel costs. | (a) |
| | "Life-cycle" based on collector area dependent costs; fixed costs; down payment, interest, term of mortgage, discount rate; insurance and maintenance; present cost of fuel and rate of increase. | (b) |
| | "Dollar Value of Fuel Saved" based on cost of fuel and furnace efficiency. | (c) |
| | "Present Worth of 15 Years of Fuel Saved" based on inflation rate and discount rate (estimates provided). | (c) |
| | "Cost of Solar System" based on $\text{cost}/ft^2$ of collector, storage, auxiliary heating installed, miscellaneous, and contractor fees. | (c) |

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(a) Original papers; Klein, Beckman and Duffie (1976 and 1977).
(b) Interactive computer program; FCHART (1976).
(c) Solar Heating of Buildings and Domestic Hot Water; Beck and Field (1976).
(d) Intermediate Minimum Property Standards for Solar Heating ....; NBS/HUD (1976).
* These parameters can often be ignored. They are used in a correction factor that is 1.0 for systems without heat exchangers and very close to 1.0 for efficient systems with exchangers.

# LOS ALAMOS SCIENTIFIC LABORATORY METHOD (LASL)

| | | |
|---|---|---|
| Computation level: | Hand calculator for LC (Load-Collector ratio) approach. | (a,b) |
| | Hand calculator with trig functions for X-factor. | (a,b) |
| Units: | Engineering | (a,b) |
| Solar system types: | Liquid flat plate collector, heat exchanger to storage tank, w/wo domestic hot water, forced air heat. | (a,b) |
| or: | Air flat plate collector, rock bed storage, w/wo domestic hot water, forced air heat. | (a,b) |
| Solar data needed: | Monthly total radiation on tilted surface. | (a,b) |
| | Monthly total radiation on horizontal surface and tilt calculation. | (a,b) |
| Tilt calculation: | Equation for latitude $+10^{o}$, south orientation. | (a,b) |
| Weather data needed: | Monthly degree days. | (a,b) |
| System parameters: | For basic method (any location); none. | (a,b) |
| | For six special cities with hourly solar data graphs show liquid system performance dependence on: type of collector (single vs. double glazing, selective surface); collector orientation, tilt, cover glass transmissivity, surface absorptance and emittance, coolant flow rate, heat transfer coefficient, back insulation, and heat capacity; distribution pipe insulation, heat exchanger effectiveness; thermal storage heat capacity and heat losses; design water temperature. | (b) |
| | For air systems, graphs show dependence on: collector heat transfer effectiveness; air flow rate, thermal storage capacity, and rock bed temperature distribution. | (b) |
| Space heating input: | Building load in Btu per degree-day. | (a,b) |
| Hot water input: | Estimated load. | (a,b) |
| Cost analysis: | "Cost of Solar Heat" in dollars per million Btu's based on: system installation cost/$ft^2$; annual capital fixed charge rate; and annual operating, maintenance and repair cost. | (b) |
| | "Break-Even Point" in dollars per $ft^2$ of collector based on: alternate energy cost and forecasted annual increase; and useful solar energy delivered per $ft^2$ of collector. | |

(a) Original paper; Balcomb and Hedstrom (1976).
(b) ERDA's Pacific Regional Solar Heating Handbook; ERDA-SAN/LASL (1976).

# MARTIN MARIETTA METHOD (SOLCOST)

| | |
|---|---|
| Computation level: | Batch process computer program. |
| Units: | Engineering. |
| Solar system types: | Space and domestic hot-water heating systems with air or liquid collectors. |
| or: | Absorption cycle air conditioning. |
| or: | Solar assisted heat pumps. |
| or: | Systems with some passive features. |
| Collector types: | Flat plate, evacuated tube, one- or two-axis trackers. |
| Solar data needed: | Percent possible sunshine and clearness number (default value of clearness number supplied by program from contour map). |
| Tilt calculation: | Built in for any tilt and orientation. |
| Weather data needed: | Minimum/maximum temperature.<br>Heating degree-days.<br>Min/max relative humidity (solar cooling only). |
| System parameters: | Collector efficiency parameters from efficiency curve.<br>Storage capacity per collector area (liquid systems only).<br>Fuel type, efficiency of auxiliary heat source.<br>COP for solar assisted heat pump (heat pump application only).<br>Various flags to specify collector type. |
| Heat/cool input: | Building Load in energy units. |
| or: | Monthly fuel bills and description of existing HVAC system (retrofit only). |
| or: | Building dimensions for buildings meeting ASHRAE standard 90-75. |
| or: | UA (U-factor) in Btu/hr-$^{o}$F. |
| or: | Detailed specification of building for steady-state calculation. |
| or: | Detailed specification for transient calculation. (Recommended by the authors for buildings with passive features.) |
| Hot water input: | Hot water load in energy units. |
| Cost analysis: | "Life cycle" relative to a reference system.<br>The following types of information are used:<br>Reference System: initial installed cost and maintenance.<br>Solar System: fixed cost, installed cost per unit collector area, liquid storage installed cost per gallon, maintenance cost.<br>Finance/Tax Data: scenario indicator (residence, business, non-profit), loan interest rate, loan term, loan down payment, insurance, property tax rate, income tax rate, various depreciation factors for businesses.<br>Fuel Costs: dollars per unit; escalation rate; heat content per unit for any of natural gas, electricity, fuel oil, LPG, coal. |

Note: All entries referenced to SOLCOST User's Guide; Martin Marietta (1977).

# APPENDIX II : ECONOMIC EVALUATION OF SOLAR SYSTEMS

## Introduction

Solar radiation is a "free" source of energy but to capture this free energy the user must invest a significant amount of money in solar collection equipment. (A solar system for a residence will cost approximately $7,000 to $15,000.) Once this initial investment is made, yearly energy costs consist of maintenance, taxes, interest and auxiliary energy used during exceptionally cold and cloudy periods. These costs must be compared to the alternative of a conventional heating system and increasing yearly payments for fossil fuels.

Many economic analyses of solar systems are available in government publications and the solar energy literature. Some of the solar design methods reviewed in this Manual include economic analyses as part of the package. For example, one prepared program available for hand programmable calculators (TI-59 or HP-67) includes in its economic analyses: the mortgage period; the mortgage interest rate; the general inflation rate; the insurance rate; the effective federal-state income tax rate; the property tax rate; tax credits; the down payment; the salvage value; the investment tax credit; the period of analysis; the market discount rate; the operating, maintenance, and fuel costs and their rates of increase; the system base cost and the collector costs. Depreciation can be calculated using either declining balance, straight line or sum of year's digits.

All economic analyses depend on predictions of future inflation rates, fossil fuel costs and solar equipment costs. These predictions have a high degree of uncertainty. Further, small changes in the assumed values of these quantities can make dramatic changes in the economic conclusions. There is some consensus of expert opinion on the following important points: (a) Energy cost will increase about 1% per year above the inflation rate, and (b) Solar equipment costs will probably increase with the inflation rate with only minor possible reductions with mass production.

## A Simple Economic Model

A simple method of economic analysis is presented below for the solar designer who wants to do it himself. This method was developed under a Department of Energy grant by Charles D. Kolstad of Los Alamos Scientific Laboratory.

The analysis utilizes "real dollars" to simplify the calculations. For example: if the inflation rate is 8% and the cost of a solar loan at the bank is 11% the "real interest" is 11% - 8%, or 3%. If you are paying for the solar system with money from your savings account which pays 3½% then the "real interest" for your money is 3½%. Similarly, if fuel costs escalate at 9% overall rate with an 8% inflation rate, the "real" escalation rate of fuel costs is 1% per year. A form for effecting the economic analysis is given in Table A II-1.

## Sample Economic Analysis

Assume we wish to install a solar system on a new house. The system will use 15 $m^2$ of collector and a performance analysis predicts that the system will supply 68% of the annual energy requirement. A heat load analysis predicts an annual requirement of 120 x $10^9$ Joules (120 GJ). The system will cost $10,000. The alternative is to use electric resistance heat. The average cost of power at the site is $0.025/kW-hr (or $6.94/GJ).

The federal tax credit will be $2,200 on this system and the Montana tax credit will be $275. The total tax credit is thus $2475. The bank will loan us the money for the system at 12% for 20 years and the inflation rate is estimated at 8%. This interest is a deduction on our federal taxes, which for our tax bracket reduces the effective interest rate by 1%. These values are entered into the form in Table A II-2. The sample calculations show that this solar system costing $560/year would be economically competitive with electric heat costing $566/year. Note that if natural gas is available, this solar system, using the listed assumptions, would not be economically competitive over the 20 year period.

It is suggested that the solar designer go through this economic analysis for several combinations of assumptions of fuel escalation rate and inflation rate.

| | | |
|---|---|---|
| System cost | | A |
| Tax credit | | B |
| Net system cost | | C = A − B |
| Real interest rate | | D |
| Real fuel escalation rate | | E |
| Tax deduction for interest | | F |
| Net real interest rate | | G = D − E − F |
| Annualized cost | | H |
| Annual maintenance | | I |
| Annual solar cost | | J = H + I |

Notes:

A. Total installed cost of solar system

B. Federal and state tax deductions (ask tax consultant)

D. Annual interest minus inflation (ask bank for information)

E. Consult expert (about 1%)

F. Depends on your tax bracket (ask tax consultant)

H. Use Tables for Net Cost and Net real interest

I. Usually 1% to 5% of initial cost

K. Use calculated heat load or past fuel bills

L. From solar performance calculations

M. Ask utility company

N. M x 1 for electric heat; M x 1.6 for gas or oil

O. Assuming no solar system is installed

| | | |
|---|---|---|
| Annual heat load | | K |
| Annual solar heat | | L |
| Current energy cost | | M |
| Net energy cost | | N |
| Annual cost of alternative heat | | O = K x N |
| Annual value of solar heat | | P = L x N |

(Cost) $/kWh x 278 = (Cost) $/GJ

(Cost) $/$10^6$ BTU * .95 = (Cost) $/GJ

1 x $10^6$ BTU = 1.05 GJ

Table A II-1: ECONOMIC ANALYSIS

| | $ Annual payment/$1000 loan | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Yrs. | 1% | 2% | 3% | 5% | 7% | 8% | 9% | 10% |
| 5 | 206 | 212 | 218 | 231 | 244 | 250 | 257 | 264 |
| 10 | 106 | 111 | 117 | 129 | 142 | 149 | 156 | 163 |
| 20 | 55 | 61 | 67 | 80 | 94 | 102 | 110 | 117 |
| 25 | 45 | 51 | 57 | 71 | 86 | 94 | 102 | 110 |
| 30 | 39 | 45 | 51 | 65 | 81 | 89 | 97 | 106 |
| 40 | 30 | 37 | 43 | 58 | 75 | 84 | 93 | 102 |
| 50 | 26 | 32 | 39 | 55 | 72 | 82 | 91 | 101 |

| | | |
|---|---|---|
| System cost | $10,000 | A |
| Tax credit | $ 2,475 | B Fed+state |
| Net system cost | $ 7,525 | C = A − B |
| Real interest rate | 4% | D 12%−8% |
| Real fuel escalation rate | 1% | E assumed |
| Tax deduction for interest | 1% | F approx. |
| Net real interest rate | 2% | G = D − E − F |
| Annualized cost | $460 | H $.061 × 7.525 |
| Annual maintenance | 100 | I .01 × $10,000 |
| Annual solar cost | $560.00 | J = H + I |

Notes:

A. Total installed cost of solar system

B. Federal and state tax deductions (ask tax consultant)

D. Annual interest minus inflation 8% inflation (ask bank for information) 20 year loan

E. Consult expert (about 1%) assume 1%

F. Depends on your tax bracket about 1% (ask tax consultant)

H. Use Tables for Net Cost and Net real interest →

I. Usually (1%) to 5% of initial cost

K. Use calculated heat load or past fuel bills

L. From solar performance calculations 68% solar

M. Ask utility company $ .025/kWh × 278 = $6.94/GJ

N. (M x 1) for electric heat; M x 1.6 for gas or oil

O. Assuming no solar system is installed

| | | |
|---|---|---|
| Annual heat load | 120 GJ | K |
| Annual solar heat | 81.6 GJ | L .68 × 120 |
| Current energy cost | $6.94/GJ | M |
| Net energy cost | $6.94/GJ | N M × 1 electric heat |
| Annual cost of alternative heat | $832.80 | O = K x N 120 × $6.94 |
| Annual value of solar heat | $566.00 | P = L x N 81.6 × $6.94 |

(Cost) $/kWh x 278 = (Cost) $/GJ

(Cost) $/$10^6$ BTU * .95 = (Cost) $/GJ

1 x $10^6$ BTU = 1.05 GJ

Table A II-2: SAMPLE ECONOMIC ANALYSIS

| $ Annual payment/$1000 loan | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Yrs. | 1% | 2% | 3% | 5% | 7% | 8% | 9% | 10% |
| 5 | 206 | 212 | 218 | 231 | 244 | 250 | 257 | 264 |
| 10 | 106 | 111 | 117 | 129 | 142 | 149 | 156 | 163 |
| (20) | 55 | (61) | 67 | 80 | 94 | 102 | 110 | 117 |
| 25 | 45 | 51 | 57 | 71 | 86 | 94 | 102 | 110 |
| 30 | 39 | 45 | 51 | 65 | 81 | 89 | 97 | 106 |
| 40 | 30 | 37 | 43 | 58 | 75 | 84 | 93 | 102 |
| 50 | 26 | 32 | 39 | 55 | 72 | 82 | 91 | 101 |

# APPENDIX III: ACCURACY OF SIMM SOLAR RADIATION MEASUREMENTS

## Instrumentation

The solar radiation measurements were made using a silicon cell-based transducer fabricated by Fowlkes Engineering and a Rustrak Model 288, 0-1 ma, strip chart recorder. The silicon cell is 2 cm square and is attached flush to the center of a flat aluminum heat sink approximately 8 cm square. An aluminum reflective mask, 8 cm square and 0.5 mm thick, having a 1.9 cm square hole is centered over the silicon cell. A piece of double strength window glass, 8 cm square and 3 mm thick, covers the assembly. The assembly is sealed along the perimeter with clear silicone rubber caulking to prevent moisture from entering. The purpose of the reflector and the heat sink is to stabilize the temperature of the silicon cell.

The output of the silicon cell is shunted with a wire wound resistor having a resistance of less than 1 $\Omega$ . The voltage drop across this resistor at normal incidence on a clear day is about 80 mv. The recorder has an input impedance of about 100 $\Omega$ and is consequently deflected to about 80% of full scale at solar noon on a clear day. To reduce the effect of lead resistance, two- conductor, #18 solid copper wire is used to connect the transducer to the recorder.

## Initial Calibration

Each transducer-lead wire-recorder assembly is individually calibrated by comparison to a Kipp or Eppley pyranometer. The reference pyranometer and silicon cell transducer are mounted in the same plane. The plane of the transducers is adjusted approximately normal to the solar radiation on a clear day near solar noon. Several simultaneous readings of both instruments are averaged to establish the initial calibration factor. The reference pyranometers used in this project were two older Kipp instruments and a new Eppley. Although none of these instruments had recent calibrations they agreed to within about 6% in the horizontal plane on a clear day (May 8, 1976). The daily total energy density for that same day was 5% higher than the published ASHRAE value.

## Silicon Cell Characteristics

Silicon cell characteristics relating to solar flux measurement are well documented in the literature (see References) and several commercial silicon cell instruments are available. Briefly, the silicon cell characteristics causing departures from pyranometer readings are due to spectral response, temperature changes and cosine response. The spectral response will cause the silicon cell to read measurably higher on cloudy days and within 2 hours of sunrise or sunset. The instruments used in this program, for example, will be 0.015 $kW/m^2$ high under conditions of 80% beam attenuation due to clouds. The amplitude error in this condition is $\pm$ 6%. The effect of this spectral error on the monthly average, daily total energy density (the values tabulated in this Manual) is typically reduced to less than 3%. This reduced error is due to the relatively low energy density on cloudy days. Similarly, amplitude errors near sunrise and sunset have a small effect on daily total energy density: less than 2% on a clear day.

Temperature coefficients of about +0.001/°C are given in the literature for silicon cells used for flux measurements. All instruments used in this project were calibrated during the month of January. Summer operating temperatures would be about 35° C higher which, based on + 0.001/°C, would produce 3.5% higher amplitudes for a given radiant flux. It might be noted that some commercial pyranometers have a temperature sensitivity of about -0.001/°C.

## Orientation Errors

The nominal plane of measurement is 60° up from horizontal and south facing. No thorough measurements are available to establish typical accuracy of the plane of the transducers at this time. The attachment bracket was fabricated to $\pm$ 1° and many of the transducers used buildings oriented true south for mounting. A compass was used in some cases, corrected for the local magnetic deviation, to establish the azimuth.

The error due to misalignment varies as cos $(\theta + \delta)$ where $\delta$ is the misalignment and $\theta$ is the angle between the radiation on a normal-

to-the-transducer plane. At solar noon during the heating season this error would be a maximum of around 0.3% per degree of misalignment. This error will be assumed negligible until further data and analyses are available.

Recorder Errors

The published absolute accuracy of the strip chart recorders is 3%. This error is reduced significantly since the recorders are directly calibrated in conjunction with the transducers. The readability of the recorder during calibration, using a magnifier, is estimated at better than $\pm$ 1%.

The electrical circuit used is sensitive to changes in lead resistance. This factor has probably been the primary source of error in this measurement program. At a few stations extra lead wire was installed after calibration. Even more important have been resistance variations due to improperly soldered lead wire connections. The gradually increasing contact resistance leads to a gradual reduction in sensitivity of the instrument. In a few cases this problem has been responsible for temporary errors of 10 and 20%.

Data Reduction Errors

Strip chart data is processed by tracing the curves on a digitizer platen connected to a microcomputer. The resolution of the platen is 0.1 mm and each curve is represented by 200 to 400 coordinates. The reading error due to resolution is thus less than 1%. The primary source of data reduction error is the repeatability of the curve tracing itself. On clear days, where the curve is a well defined line, the reproducibility averages 1%. On cloudy days the reproducibility can reach 5 to 20%. This is due to the fast response of the silicon cell which produces a very rough, jagged curve on some cloudy days (see cover of Manual for examples of curves).

During the last year reproducibility tests have been run on over 800 data days (4% of our total data base). The reproducibility of the monthly average, daily total energy density averages better than $\pm$ 2%.

These monthly values often reproduce within 1% due to the compensation of positive and negative errors when averaged.

Data Correction Procedures for SOLMET

The Department of Energy has sponsored programs to compile and review historical solar insolation data for the purpose of providing a data base for the design of solar energy conversion devices. Expert review of the data pointed to a myriad of errors due to instrumentation, data collection and presentation. Programs were subsequently initiated to "rehabilitate" this data base.

A key part of the rehabiliatation consisted of reviewing approximately 190,000 solar radiation charts and extracting the radiation intensity at solar noon on clear days. A parallel effort consisted of computing predicted clear-day noon radiation using a variety of theoretical models and atmospheric data. The comparison of the theoretical and experimental clear-day data identified unreliable solar data (some data being 20% in error). The comparison further helped provide correction factors which were applied to the experimental data to produce the "rehabilitated" solar data base. The rehabilitated data is believed to be accurate to within $\pm$ 5%. This data is now available in the form of tables and computer-readable tapes for 26 locations in the United States; Great Falls is among the rehabilitated stations.

Estimates of the solar radiation at an additional 222 locations were derived from atmospheric data and are included in the SOLMET data base. Eight of these locations are in Montana. The accuracy of this calculation method for Great Falls is $\pm$ 13% for daily values and $\pm$ 4% for monthly averages.

Data Correction Procedures for SIMM

The clear-day comparison procedure described above was also utilized in processing the data presented in this Manual. This comparison significantly reduces the probability of large errors in the solar radiation due to faulty instrumentation. We were fortunate to have the guidance of expert consultants in this crucial area.

Douglas V. Hoyt of NOAA in Boulder, Colorado was involved with the rehabilitation of the SOLMET data base using his theoretical model for the calculation of solar noon atmospheric transmission. He was able to provide us with theoretical clear-day values on a $60^{o}$ tilted surface for Great Falls using his comprhensive atmospheric model. He also advised us as to the effect of altitude on our clear-day values and provided general guidance in assessing the accuracy of the data.

John Yellott has provided useful advice on the behavior of silicon cell-based instruments for measuring solar radiation since the inception of this measurement program. Prof. Yellott holds a patent on the temperature compensated silicon cell radiometer. He also advised us concerning the use of the ASHRAE clear-day model for checking instruments for calibration drift.

Our Theoretical Clear-Day Model

For this report we used a theoretical clear-day model based on one given in the ASHRAE Handbook of Fundamentals. Our model included an adjustment for altitude consisting of a clearness factor allowing + 1% per 1000 feet in elevation. The effect of ground reflection was included by assuming a reflectance of 0.5 (snow) for Nov. 15 to March 1 and a reflectance of 0.2 during the remainder of the year.

The results from Doug Hoyt's clear-day model and our modified ASHRAE clear-day model are shown in Figure A III-1(a) for Great Falls along with the experimental data. The two theoretical curves are within $\pm$ 2.5%. Most of the experimental data is also contained in this $\pm$ 2.5% error band.

Note that some experimental clear-day values in winter are as much as 5% above the theoretical values. Several stations showed a similar relative increase in clear-day values during winter. At this time we don't know if the experimental data or the theoretical model is responsible for this departure. The Great Falls experimental data was not corrected due to the close agreement with the theoretical values.

Figure A III-1(b) shows the clear-day comparison for Glendive. The discrepancy between the theoretical and experimental values suggested a uniform offset in the calibration factor of 4.5%. The data presented in

the tables is the raw data multiplied by a factor of 1.045. The dashed curve in Figure A III-1(b) shows how this offset factor produces an improved fit between the experimental data and the clear-day model.

Summary

The expected error in the monthly average data for any station has been summarized by assigning to each station a classification ranging from I to III. This error classification was based primarily on comparisons of theoretical and experimental clear-day values, before and after adjustment. Table A III-1 lists these comparisons.

Additional information from our instrument records and fault code files was also used to refine the classification. For example, Helena is Class I even though the adjusted error is 4.6, the highest of any Class I station. This scatter is due to a characteristic haze in Helena which effects the "clear-day" values. Lewistown was rated Class III even though the adjusted clear day error was only 2.3% (less than many Class I stations). Lewistown's rating was reduced due to persistent problems with unreliable connections and slipping chart paper which reduced the overall integrity of the data.

Based on our current clear-day model we suggest the following overall error bands for monthly average data:

| | |
|---|---|
| Class I stations | ± 3% |
| Class II stations | ± 5% |
| Class III stations | ± 8% |

One of the SIMM instruments was recently calibrated by Edwin Flowers of the National Oceanic and Atmospheric Administration, Environmental Research Laboratories, Boulder, CO. The instruments in the field will be compared to this reference instrument during the coming year. If there are serious discrepancies the data base in this Manual will be up-graded in following Manuals.

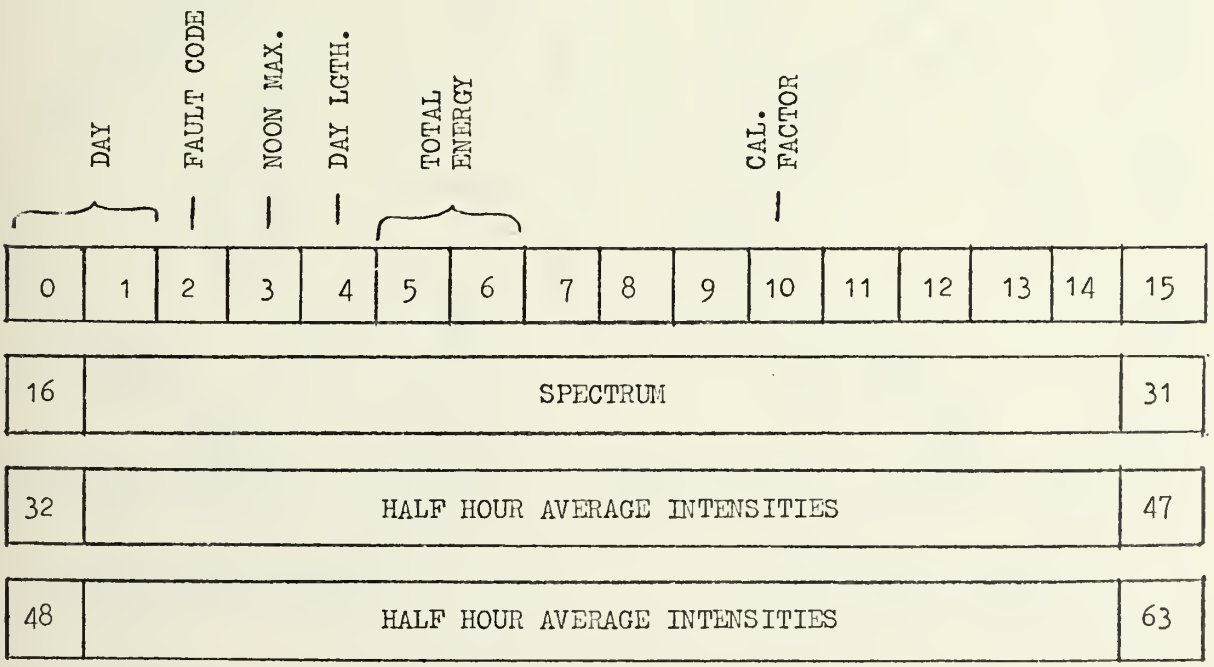
Initial comparisons indicate that if there is a significant discrepancy the solar data in this Manual will be conservative; i.e., less than the true value. (A solar system designed using radiation data that is 10% low will produce about 5% more heat than expected.) The errors in the present data in this Manual are probably less than the error band of most solar system design methods.

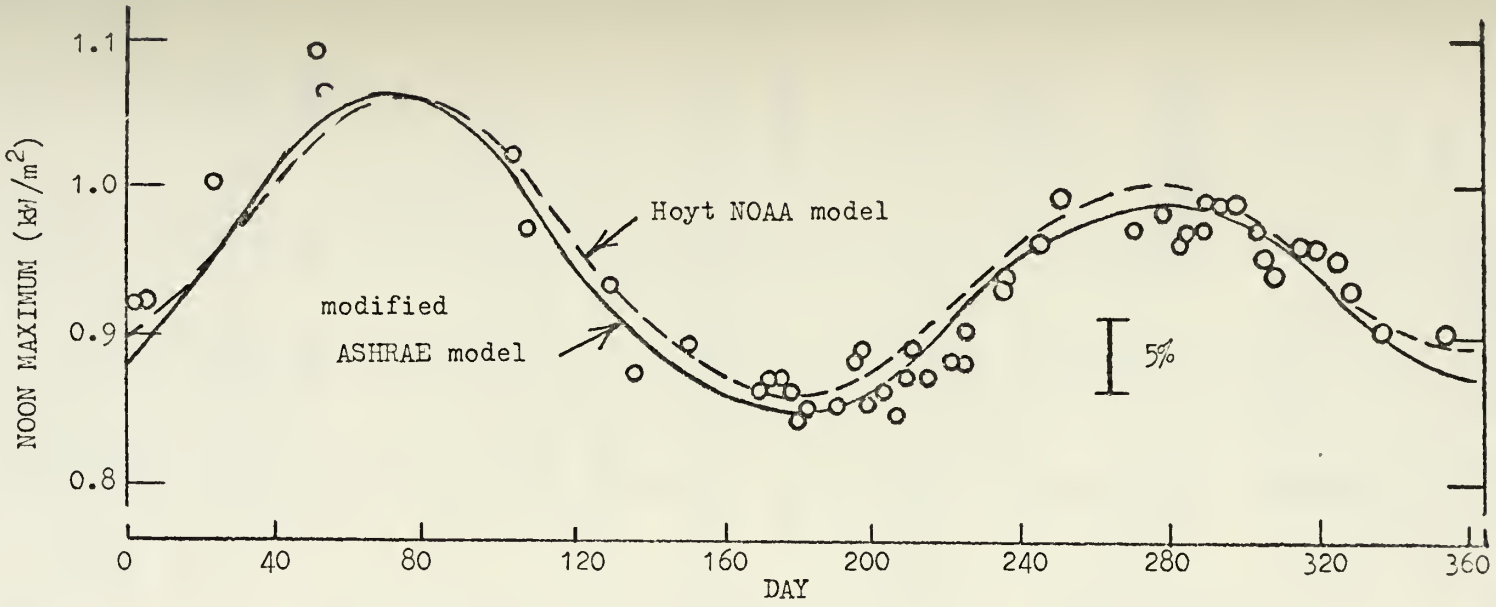
File Structure

The processed data from each day consists of day number, total energy density, day lenth, noon maximum intensity (if day was clear), intensity spectrum, half-hour average solar intensities, and a fault code (specifying lost or suspect data). The total energy is stored in 2 (8 bit) bytes and thus has a maximum resolution of 1 part in 512. All other non-integer quantities are rounded to integers and stored in a single byte in the file (maximum resolution 1 part in 256). The maximum loss of precision in this data due to rounding off is 0.5%.

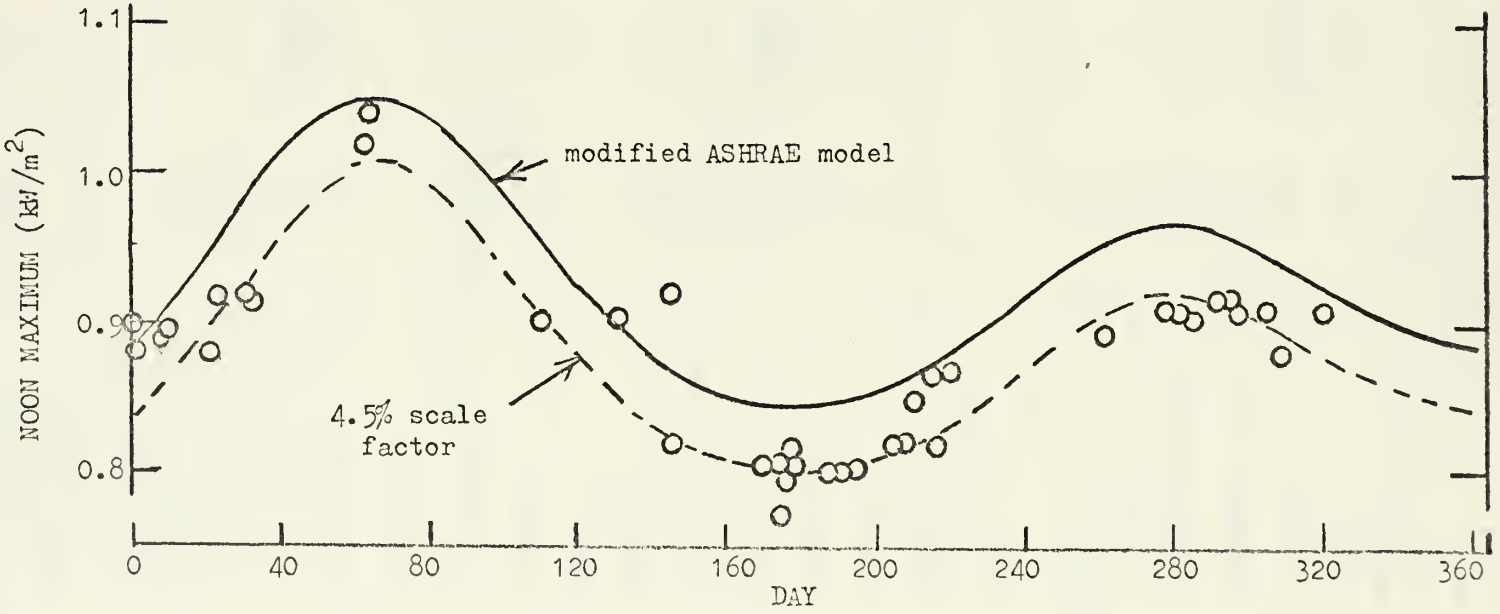
The data are stored on hard sectored, $5\frac{1}{4}$ inch magnetic diskettes using the North Star Disc Operating System (a popular microcomputer format). Each single-density diskette contains 3 station-years of solar data. This data has been used by Fowlkes Engineering as input to solar heating simulation models. Copies of these diskettes can be supplied at nominal cost for users wanting to implement their own simulation programs.

FILE STRUCTURE, 1 STATION - DATA - DAY






(a) Great FAlls data for 1978 showing two clear-day models with data




(b) Glendive data for 1978 illustrating use of scale factor

Figure A III-1 : Comparison of clear day experimental and theoretical values

Table A III-1: CLEAR DAY COMPARISONS

| Station name | 1977 * Clear days | 1977 Deviation,% ** Orig. | 1977 Deviation,% ** Adj. | 1977 Class | 1978 Clear days | 1978 Deviation,% ** Orig. | 1978 Deviation,% ** Adj. | 1978 Class |
|---|---|---|---|---|---|---|---|---|
| Anaconda | | | | | 21 | 4.0 | 3.4 | II |
| Billings | 20 | 5.2 | 2.06 | I | 56 | 4.7 | 3.3 | I |
| Bozeman | 27 | 4.1 | 2.8 | I | 58 | 4.1 | 2.8 | I |
| Browning | 34 | 8.5 | 2.5 | II | 38 | 5.1 | 3.4 | I |
| Butte | 25 | 7.4 | 2.2 | II | 15 | 5.1 | 2.9 | I |
| Choteau | | | | | 49 | 4.5 | 2.2 | I |
| Colstrip | 14 | 3.7 | 1.7 | I | 55 | 3.2 | 3.0 | I |
| Dillon | 46 | 8.0 | 6.1 | III | 56 | 5.9 | 4.1 | II |
| Ennis | | | | | 34 | 3.6 | 2.2 | II |
| Fort Benton | | | | | 33 | 4.9 | 1.8 | II |
| Glasgow | 58 | 9.1 | 2.3 | II | 65 | 7.2 | 3.1 | II |
| Glendive | 45 | 5.6 | 2.3 | I | 40 | 5.1 | 3.1 | I |
| Great Falls | 50 | 2.5 | 2.5 | I | 51 | 2.3 | 2.3 | I |
| Hamilton | 20 | 8.4 | 3.2 | III | 25 | 9.4 | 4.0 | III |
| Harlowton | 43 | 6.2 | 2.1 | II | 35 | 8.9 | 2.0 | II |
| Havre | 42 | 3.1 | 2.0 | I | 41 | 4.0 | 3.3 | II |
| Helena | 36 | 7.0 | 3.4 | I | 44 | 5.7 | 4.6 | I |
| Jordan | | | | | 55 | 10.2 | 3.5 | III |
| Kalispell | 35 | 3.3 | 3.01 | I | 42 | 5.3 | 5.1 | II |
| Lewistown | 36 | 6.8 | 2.5 | I | 34 | 8.2 | 2.3 | III |
| Libby | 28 | 2.1 | 2.5 | I | 34 | 5.7 | 3.6 | II |
| Livingston | | | | | 35 | 6.8 | 4.8 | III |
| Miles City | 45 | 5.0 | 1.7 | II | 41 | 3.5 | 3.5 | I |
| Missoula | 33 | 5.0 | 2.7 | I | 45 | 5.8 | 4.1 | II |
| Plentywood | | | | | 24 | 10.0 | 5.9 | III |
| Polson | 41 | 4.0 | 1.4 | I | 52 | 3.8 | 1.7 | I |
| Red Lodge | | | | | 45 | 9.6 | 4.3 | III |
| Sidney | | | | | 16 | 5.6 | 3.6 | II |
| Thompson Falls | | | | | 28 | 4.7 | 4.0 | II |
| W. Yellowstone | 27 | 11.1 | 3.2 | III | 46 | 11.1 | 5.6 | III |

* A "clear day" is a day that is clear for several hours around solar noon.

** Average absolute value of deviation for all clear days.

# APPENDIX IV: CONVERSION IDENTITIES

**LENGTH m,**
1 meter = 3.2808 feet
1 meter = 39.3701 inches
1 km = 0.62137 miles
1 ft/min = 0.00508 m/s
1 mile/h = 0.44704 m/s
1 km/h = 0.277778 m/s

**TEMPERATURE:**
$t^\circ F = (1.8 \times T^\circ C) + 32$
$T^\circ C = (t^\circ F - 32)/ 1.8$

**MASS kg,**
1 lb = 0.45359237 kg
1 oz = 28.3495 g
1 $lb/ft^3$ = 16.0185 $kg/m^3$
1 lb/h = 0.00012599 kg/s

**ENERGY**
1 kWh = 3410.08 Btu
1 kWh = 3600 kJ
1 Btu = $2.928 \times 10^{-4}$ kWh
1 Btu = 1.0548 kJ
1 Btu = 0.251996 kcal
1 Btu = $10^{-5}$ therm
1 Btu = $10^{-15}$ quad

**POWER**
1 kW = 3414.43 Btu/h
1 kW = 56.8253 Btu/min
1 kW = 238.662 cal/sec
1 Btu/h = $2.931 \times 10^{-4}$ kW
1 Btu/h = 0.01667 Btu/min
1 Btu/h = 0.0700 cal/sec
1 Btu/h = $3.9275 \times 10^{-4}$ hp

**AREA $m^2$,**
1 $m^2$ = 10.7639 $ft^2$
1 $m^2$ = 1550 $in^2$
1 $km^2$ = 0.3860 $mile^2$
1 $km^2$ = 247.105 acres

**VOLUME $m^3$,**
1 $ft^3$ = 28.3168 liters
1 U.S.gal = 3.78544 liters
1 $ft^3/lb$ = 0.062428 $m^3/kg$
1 cfm = 0.471947 liter/s
1 U.S. gpm = 0.0630907 liter/s

**FORCE newton N,**
1 lbf = 4.44822 N
1 psi = 6.89476 kPA
1 in $H_2O$ = 249.089 Pa
1 atm = 101.325 kPa

**ENERGY DENSITY**
1 $kWh/m^2$ = 316.815 $Btu/ft^2$
1 $kWh/m^2$ = 3600 $kJ/m^2$
1 $kWh/m^2$ = 360 $J/cm^2$
1 $kWh/m^2$ = 85.933 $cal/cm^2$ (langley)
1 $Btu/ft^2$ = $3.1517 \times 10^{-3}$ $kWh/m^2$
1 $Btu/ft^2$ = 11.3538 $kJ/m^2$
1 $Btu/ft^2$ = 1.13538 $J/cm^2$
1 $Btu/ft^2$ = 0.27125 $cal/cm^2$ (langley)

**POWER DENSITY**
1 $kW/m^2$ = 317.21 $Btu/ft^2$-h
1 $kW/m^2$ = 3600 $kJ/m^2$-h
1 $kW/m^2$ = 0.1 $W/cm^2$
1 $kW/m^2$ = 0.23901 langley/sec
1 $kW/m^2$ = 14.3406 langley/sec
1 $Btu/ft^2$-h = 3.1524 $W/m^2$
1 $Btu/ft^2$-h = 11,348 $kJ/m^2$-h
1 $Btu/ft^2$-h = $3.1524 \times 10^{-4}$ $W/cm^2$
1 $Btu/ft^2$-h = $7.5347 \times 10^{-5}$ langley/sec
1 $Btu/ft^2$-h = $4.5208 \times 10^{-3}$ langley/min

The following prefixes are recommended for use with SI units:

tera T $10^{12}$, giga G $10^{9}$

mega M $10^{6}$, kilo k $10^{3}$

milli m $10^{-3}$, micro $10^{-6}$

nano n $10^{-9}$, pico p $10^{-12}$

## SOME PROPERTIES IN SI UNITS

### Density ($kg/m^3$)

| | |
|---|---|
| Copper | 8795 |
| Steel | 7850 |
| Aluminum | 2675 |
| Glass, standard | 2515 |
| Concrete, typical, building | 2400 |
| Water, 4° C | 1000 |
| Ice, -1° C | 918 |
| Gypsum plaster, dry, 23° C | 881 |
| Oak, 14% wet | 770 |
| Pine, 15% wet | 570 |
| Pine fiberboard, 24°C | 256 |
| Asbestos cement, sheet, 30° C | 150 |
| Cork board, dry, 18° C | 144 |
| Ebonite, expanded, 10° C | 64 |
| Mineral wool, batts, -2°C | 32 |
| Polyurethane, foam, rigid | 24 |
| Polystyrene, expanded, 10° C | 16 |
| Air, $p_o$, 20° C | 1.204 |

### Heat of vaporization (kJ/kg)

| | |
|---|---|
| Water, 20° C | 2454.0 |
| Water, 100° C | 2257.0 |

### Thermal conductivity (W/m° C)

| | |
|---|---|
| Copper | 385 |
| Aluminum | 211 |
| Steel | 47.6 |
| Ice, -1° C | 2.26 |
| Concrete, typical, building | 1.73 |
| Glass, standard | 1.05 |
| Water, 20° C | 0.596 |
| Asbestos cement, sheet, 30° C | 0.319 |
| Gypsum plaster, dry, 23°C | 1.170 |
| Oak, 14% wet | 0.160 |
| Pine, 15% wet | 0.138 |
| Pine fiberboard, 24° C | 0.051 |
| Cork board, dry, 18° C | 0.041 |
| Mineral wool, batts, -2° C | 0.034 |
| Polystyrene, expanded, 10° C | 0.034 |
| Ebonite, expanded, 10°C | 0.030 |
| Air, $p_o$, 20° C | 0.026 |
| Polyurethane, foam, rigid | 0.024 |

### Specific heat (kJ/kg° C)

| | |
|---|---|
| Water, 20° C, $p_o$ | 4.19 |
| Ice, -21° C to -1° C | 2.10 |
| Steam ($c_p$), 100° C, $p_o$ | 1.95 |
| Air ($c_p$), 20° C, $p_o$ | 1.012 |
| Concrete, 18° C | 0.837 |

Standard gravity $g_o$: $g_o = 9.80665$ m/s

Gas constants:

$R_u = 8314.4$ J/kmol K universal

$R_a = 287.045$ J/kg K air

Stefan-Boltzmann constant:

$$\sigma = 5.6697 \times 10^{-8} \text{ W/m}^2 \text{ K}^4$$

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